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# POONA AGRICULTURAL COLLEGE MAGAZINE



#### POONA

PRINTED AT THE "ANYA-PHISHES" PPESS, AND PLBLISHED AT POOVA

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Vishnu Narayan Gokhale.

1911.

#### POONA AGRICULTURAL COLLEGE MAGAZINE

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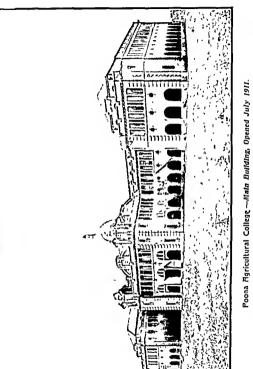
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# The Poona Agricultural College Magazine.

#### Editorial.

Agricultural College Magazine. And in doing so we have to congratulate ourselves on the merca-ung oppreciation which it has had not only among the shutents and just students of the college, but also among the general public interested in agriculture. The accounts for the second year published in the present number show a healthy financial position, which itself shows that what was originally designed os a means of intercommunication on technical matters between the college and its adamni has become already considerably more than this.

The third volume is commenced, however, with much trepidation. The chird rad manager who have piloted the venture through its first two volumes have now left as. Their work has been involumed in placing the venture on a sound footing. And we, their successors, only hope to be oble to continue in the path which they lave marked out. The magazine will still try to maintain its severely practical tone. It will welcome accounts of personal experiences and observations, whether in the Bombry Presidency or outside. It will be olways open particularly to de-criptions of personal experiences and observations, whether in the Bombry Presidency or outside. It will be olways open particularly to de-criptions of personal experiments which have the object the charidation of agricultural problems, the removal of present difficulties, or the introduction and development of yet unrecognised methods or crops,—however small the detail with which these are concerted. And we conceive that if this is manutained as the characteristic feature of the magazine, the appreciation and support which it has already received will not be wanting in the future.

The present manber will be found, we think, to be on illustration of this policy. Thus, for instance, we have three articles on rice cultivation. In one of these Mr. Padwekar, now of Khed in Ratingiri, discusses the general manner and methods of rice growing in the districts which he personally knows; Rao Sahoh G. K. Kelkar gives an account of escries of very important experiments in the Konkan for reducing the area which it is necessary to devote to the seed hed in growing

transplanted rice,—and so economising the seed rice, which at present, forms a much larger amount per acre than is probably necessary; and thrilly Mr. K. V. Joshi records his experiences in combating that enemy of rice cultivation, and particularly of the necesced bed,—the land crab.

The same practical character will be seen in the paper on six six six of Sonthern Gujarat, we are convinced that the study of weeds is important for the agrantlner of Western India, and we are indebted to Mr. Keatinge for allowing the reproduction of this paper,—a summary of a prize essay contributed by several past students as a result of their personal study in the Surat detrict.

There are two further papers on the question of improving eattle and nereasing their number. One of these,—that by Mr. R. S. S. Hiremath,—was undvertently omitted from the last number of the magazine,—but in the meantment has been looked over and improved by its nuthor. The other, by Mr. K. M. Pawar, is by one who has lived all his life in close touch with the actual problems he discusses, and whose ornmon is, therefore, entitled to considerable weight.

A new type of article is that by Mr. Il. S. Patel on Gujarat proverbs relating to egriculture. We could do with many articles of this sort. There is an immense amount of experience enshrined in the proverbs and enstomary syrings of a people, and we hope that not only will Mr. Patel furnish as with a further selection at a later date, but that others may be inspired to form a similar collection for other resease in which their work more particularly lies.

The other articles need no special reference: we send forth the magazine feeling that it will be found useful in many directions, and with our very sincere thanks to those, chiefly past students, who have placed the treasury of their experience at our disposal.

We must refer to one more point. Among the college students what we just graduated, there are those who come from parts of India as widely separated as the extreme north east in Upper Assum, and from the extreme vect, on the borders of Baluchistan. To those witely separated representatives of our college, as to all others, we offer our hearty congratulations on the position they have already achieved. May it, however, be only the beginning 2 By sterling work, by untring energy, by a determination to be thorough and accurate in all they do, may they go forward from success to success. And may this magazane be always a bond which will bind them to their alma mater 1

#### The late Rao Bahadur Mallappa Basappa Varad.

e V

D. L. Sahasrabuddhe, B. Se., L. Ag., Lecturer in Chemistry, Poons Agneditaral College.

IIII.OSOPINY and science agree with each other at least in one respect unamned as philosophy says 'Example is botter than precept,' and secure also gives greater respect to a practical man than to me who has not gone leyond the pule of book knowledge. Why do we real and study the lives of great men? Not because philosophical works do not tell us to live a life of high morality, not because poetry does not teach us to appreciate nature's beauty and not even because the precedings of great men do not teach us to do our duty, to work for our own and our country's good and raise our nation to a higher level, but because the lives of great men are examples and illustrations which convince as that what books say is not mere theory and can be brought into practice and acted upon if we wish to do so.

Ruo Bahadar Appa Subeb Varad was a great citizen and a patriot, a man of calture and of high moral chracter, and a mun of liberal charities. He took a very prominent purt in all the activities of his city—Sholapar, was a great leader in commerce and from our point of view, above all a pioneer in scientific agriculture. His life was an exemplary one in all its aspects and is well worthy of close study by our young men. It is beyond the scope of our ungazine to deal with all the aspects of his life and hence I must restrict myself to his activities as a leder in commerce and especially as a pioneer in scientific agriculture. Yet it will not be out of place to meation a few of the important facts in the life of Aroa Subeb Varad.

Rao Bahadar Mallappa Basappa Varad was born on the 17th of June 1851 at Sholapar. His father, Basappa, and his unele Chaarbasappa were born of poor parents. They opened small shops at Sholapar, but before long, by hard work and their skill in commerce, became rich and prosperous. Especially Chanadasappa rose to such high position that he became an acknowledged leader in commerce at Sholapar—then, as now, a great commercial contrea—und commanded so much respect from the people that he was considered to be a Saulha. Chanadasappa had no issue and Appa Salich was the only son of his

father. He, hence, naturally succeeded both his father and uncle. In his childhood Appa Saheb learnt to read nod write, but was not allowed to learn English as his father and uncle thought that by learning English he would be concerted to the Christian faith. Although he did not pass any examination yet he was highly educated in the proper sense of the word 'Education.' He received his training in comment his uncled's shop where he was brought up under strict discipline.

When Appa Saheb was about twenty-five years of age his uncleded and he, from this time, but to carry on the whole business on his own responsibility. His business went on increasing and flourishing and he became more and more pro-perons overy year. He soon extended his operations to Bomlay, where he opened a branch which he altimately made a greet saccess. When his Bombry branch was put on a firm footing be went on visiting the Bombry mills and studying them in detail. This he dul very regularly for about his months, and with the help of Rajibihadar Gyangrij he establised the 'Narsing-girji cotton mills' at Shohuru m 1802.

Appa Saleh knew full well that mere commerce unconnected with agriculture only means the very partial development of a country. Real commerce loos not mean carrying things from one place to another or doing the business of a broker, but the commelities must be produced with which commerce is to be carried on. On the other hand he felt that it is little use simply improving the staple food crops of the country and that it is, at the present stage, perhaps more important to introduce and develop those crops like indigo, cotton, angar-case, etc., which will bring a large money return to the cultivators, establish agricultural industries in the country, and keep agriculture connected with commerce.

Appr Sahoh had a great liking for agriculture. When he started work in that line in the year 1882 he had only a small area of land, but by degrees he increased this so reach that at the time of his death he owned four thousand acres of land and three handred bullocks, paid three thousand for hundred rupees as assessment and about eight thousand rupees as irrigation chruges anamully. He was not only fond of agriculture but stadied very curefully the indigenous methods in vegue, and always considered these as the brais for any improvement he might undertake by the application of a more advance system. He was fully continued, however, of the possibility of improvement, and devoted himself continually to bring it about, acceptang suggestions and diess from any sonce in which he could find them. He was hence always close touch with the agricultural department and its officers. When



ever he learnt that a particular method or implement was useful or labour-saving he at once tred it on his area and if it proved to be successful he brought the neighbouring cultivators to his fields and demonstrated its use to them.

With the object of growing industrial crops he brought indigo seed from Madras, grew the crop in Sholapar and extracted indigo which was valued at a high price in the Bombay and Culcutta markets, but the introduction of artificial indigo from Germany grave a blow to the indigo industry of India and this crop had to be induatoraed.

Then he directed his attention to sugar cane. He tried in number of cracking and loding. He was the first man to use a power crusher in the Decean. He demonstrated its work to the agricultural officers who then finding it to be useful introduced it on the Blanji farm. He tried experiments to economore fitted in the firmaces for boiling cane juice. He constructed ten to twelve forences in line, the excess of heat from the first farmee was taken to the second one and from the second to the fund and so on, there being a large chimney at the end of the last furnice. He increased his sugar cane nesses much that he thought of prepring sorgir, and ultimately a small sugar factory was started. This, however, was not a success, and was ultimately abundoned.

He often visited the Government experimental farms and if he saw in thing neful there he at once introduced it on his own estates. When he found that his results in sugritant del not agree with those of the Government farms he offered to the agricultural department a plot and to pay all expenses in order to see whether their results could be obtained under the conditions of his estates. This shows how very keen he was not how he liked to be convenienced by actual experiment.

When the 'Nnrsingagirji Mills' were started in 1899 there were only the thousand acres under colton in the Sholyanr district but, seeing the importance of the crop, he wrote pramphlets giving the best methods of caltivating cotton and showing what a very profitable crop it was. The pamphlets were given fren to the cultivators of the Sholapur district. He also brought seed of Dharwar—American and other varieties of cotton and distributed it among the cultivators. The vast area of about four handred thousand acres under cotton in his district is due in part, and any rate to the efforts of Appa Saheb.

Groundants hitherto grown in the Decean are an inferior type, and great efforts have been made recently by the Agricultural Department to replace this variety by various types of foreign groundants. The

caltivators are naturally averse to anything new but they had full confidence in the subject of this article. When he was induced to try these foreign varieties on his estates, and proved that they were better than the country variety in every respect, they were taken up quife extensively in his district.

In order to encourage his own men to do good work he allotted plots to his muladams and at the end of the year gave solver bracelets to those whose plots showed exceptional returns.

He was of great help in all efforts after agricultural development. When exhibitions were held at Sholapur he lent his men, bullocks and implements to the organisers. When his specimens won prizes, he, instead of taking them for himself, gave them to other cultivators.

Although Apna Sabeb was detected to commerce and agriculture year to was a much of progressive years. He had not received an English clination himself; yet he very much wished that his country men should have the best possible opportunities in this direction, even, if no exact, by going to foreign countries. He encounged Sauskrit learning also. He spent about five handred rupees a mount for a Sauskrit school at Sholapur and published many religious books for the Lingayat community.

In chanties Appa Subeb spent his money without stint, helping every institution in the Deccan without any distinction of caste or creed. He was the centre and lesder of every public movement at Sholapur. He was of opinion that to reform the whole nation every community should strive to reform itself and with this view he started several movements and institutions to advance his own people,—the Lingayat community.

His public spirited activity was acknowledged by the Government, and he was created Rao Saheb in 1900 and Rao Bahadur in 1910.

He died on the 19th January 1911 at he own home in Sholapur. The news of his death spread at once throughout the city of Sholapur. All the Government courts, the Agricultural Exhibition, the market and all the stops were closed in his bonour and there was general mourning throughout the whole of the city and much of the district. He was a man whom we could ill afford to lose,—a great and public spirited citizen. May his soul rest in peace.

#### Six Weeds of Southern Gujarat.

[ The article which follows is a summary of a prize essay submitted to the Director of Agriculture by several old atadents and graduates of the Poons Agricultural College and stationed at Surat. The whole easy is too long for publication in this magazine, but as at contains a considerable amount of important information, it is felt that this information should be made generally available. The authors, of the original every are Mesurs. K. B. Naik, K. D. Naik, D. N. Desai, R. R. Desai, Eds. ]

The characteristics of Southern Gajarat as an agricultural district are well-known. Its stiff black soil, derived from the leasalt rocks of Western India, the industry of its cultivators which makes it one of the gardens of India, the fact that its products, and perhaps most notably its cotton, stand second to none in their own way through the length and breadth of the country and combine to give it a character of its own which is well worthy of very close examination.

The weeds which are prevalent in such a district are, either such as an are of universal occurrence or the consequence of these peculiar characteristics. Primarily they depend, of course, on the nature of the soil,—the more or less stiff black regur of the district,—and of the elimate which presents the usual characteristics of the region chiefly dependent on the south west monsoon for its minfill. But the weed herbage also depends on the character of the cultivation, and the study of the weeds of a highly cultivated district is by no means devoid of interest from this round of view.

The six weeds with which the present paper deals are among the most noxious in Southern Guprat. They are as follows:—

- 1. Dabhdo. ( Eragroetis cynosuroides )
- Darci. ( Cynodon dactylon )
- 3. Khata. (Andropogon intermedius)
- 4. Gunderdo. (Scirpus maritimus)
- 5. Jowasa. (Alhagi maurorum)
- 6. Dhudi. ( Eragrostis interrupta )

OThe average rainfall at Surat is an follows —January, Pebruary, March and April-0 49 ins. May-093 ins., June-9 69 ins., July-16-32 ins., August-7:45 ins., Expumber-0-31 ins., October-1-86 ins., November-0-13 ins., December-0-08 ins., Totil-37-38 ins.

8

#### Dabhdo (Fragrostis cynosuroides).

In botanical characters this grass is very similar to other plants of the sime genus. With fibrous roots, it has a subtermaen stem system enormously developed. The stems, in fact, often posetrate the soil to a depth of from five to seven feet. The part of the stem above ground is hollow, and like similar grasses is encirtled by a shoath of leaves. These leaves are alternate, with very long leaf stalks, while the ligule at the base of the leaf proper is tough, minute, and very hair. The leaves themselves are thick and rough with a very cutting edge, and are of great length. The inflorescence is a compound spike, composed of flowers with no true perianth, its place being supplied by impricated liracts, two in number, called glumes. The fruit is a caryopsis, yielding small black seed:

Dabldo is a perennial plant growing to a height of two to three feet. As a rule, the underground stem (which is the most characteristic feature of this grass) grows horizontally but in dry conditions it often proceeds directly downward, evidently in search of water. This habit renders it evergreen and drought resisting. Year by year the depth and range of its roots increases, and so it forms continually increasing patches growing outward from one centre.

The weed has no definite flowering scason, but our observations indicate that it flowers and seeds most profusely in the rainy scason, that is to say in the months of July and August. The growth of the plant is, moreover, much more rapid in the monthsocon,—the total time from sowing to the production of rips seeds being from airty to sixty-free days at that time, and seventy to eighty days either in the cold (October—February ) or the hot weather (March—May). The seed is disseminated chiefly by wind, rain, bards and cattle, and heng very immerous, the weed spreads very rapidly. Under ordinary cultivation, the majority of the young plants share the fate of other shallow-rooted weeds, while the few that remain become very difficult to evaluate.

When a plant has had opportunity to produce an extensive underground stem system, these stems grow so strong and entangled with one
another that when an attempt is made to drill seed among them, the
lines of the drill are often broken during the newing operations. The
cultivators often, if not neally, neglect such established patches owing
to the extreme difficulty of cultivating among the underground stems,
and the great cost of digging out the weed. The extension of the underground system takes place most vigorously in the monsoon, as would be
expected,—and, in fact, only the lenger stems, with many branches,
prive off fresh off-shoots darme the bot weather.

Though a noxious weed it is not without its uses. The leaves, being long and tough are considerably employed in making backets, brooms and brashes. The local cultivators are them also in preparing packets for storing grain,—and carnon-ly enough, the whole plut is considered as holy by the Ilindu population. The finely pounded flowers are much esteemed as a medicane in cases of cataract. The plant is of little use, in the raw state, as a fuller grass, on account of the very sharp enting edges of the leaves.

The senon-ness of this weel is becoming animally greater on account of the increasing shortage of labour, and the fart that since the great fining (1900-01) the work cattle have been deficient. The weed appears, therefore, to have obtained hold during the past ten years greater than it has had for a long time previously.

The methods which are employed, at present, by the people in dealing with this weed are as follows:—

- 1. Where there are only scattered plants, no effort is usually made to dig out the weel. But provious to sowing, at the break of the rains, the lind is hirrowed with a heavy barrow at a cost of ten to twelve aunus per acre. The weed then breaks off about three inches below the surface. This will give a respite of about six weeks.
- 2. In more serious cases, and where patches are formed, the only method in use is ploughing deeply or digging out in some other way. In ploughing, the country plough is used at the end of the rains. It lars open the surface soil, and removes the foliage and underground stems where it touches them. The deeper and vertical roots are missed altogether. For complete cradication it is generally felt that the weed must be day out in hand.

We have made several observations and experiments as to the action of various agents on the weel. From superficial observations made in the Jalalpur Links (Braach District) in three enlittators' tields, it was noticed that where a cart of cattle manner had been emptied over a patch of deblots, the foling died away after a fortnight. It is probable that much more manner was left there than was received by most parts of the field. A similar effect in the dying away of the folinge was observed when plants were treated with basic slag. This experiment was, however, only conducted with a few plants. If a small piece of assistation and catecha be introduced into a slit made in the stem of a plant, the latter withers. This has probably no direct practical application, but is worthy of note.

If n rapid growing crop like jowar can be given a start such as will deprive the weed of air and light necessary to lavariant growth, it will be checked considerably. If the foliuge be burnt off from a field badly overran with the weed, the growth will be temperarily checked, but we have no information as to its permanent effect.

The most effective systero we have found consists in deep ploughings at the close of the rams with a Ransome's C. T. 2 plough or its equivalent. This can best be done in November or December when the ground will not yet have become hard. If the plough is so adjusted as to go in to a depth of nine or ten mohes, it will remove the weed from five or six inches deeper than this, or say from fifteen inches deep. If the field is then left exposed to the sun the clods turned up will loosen, and odry off the uproted stems. A harrow, just at the break of the rams will complete the breaking up of the clods, when the fragments can easily be picked up and hurnt. The C. T. 2 wheeled plough is specially recommended for this work on account of its steadiness. It will require three and a half days to plough so acre of land infested with week. The expenses per acre, for this ploughing will be

2 pairs of hallocks, 34 days at Rs. 1/-/- per pair Rs. 7 - 0-0

Labour charges of two men for 34 days at 4 annas, each

Rs. 1-12-0

Rs. 8-12-0

If the soil is farly loose after plonghing, the fragments of the weed can be cheaply soilected by working a danata or timed harrow with a wooden stick hied across the times six to eight indice above the points. The working of the country lanta will also collect them impadly. If any plants survive this treatment repeatedly applied, they must be dug out by hand,—at present we know no other method.

The only alternative to the method above described is to dig out the weed by means of a pickane or a beavy iron but pointed at one end. This operation will require about two hundred hands per acro for one day, or a cost of at least 18: 50/-, while Rs. 10/- more will be required to trush the clots and level the land again for culturation.

Darri or Hariali ( Cynodon dactylon )

This grass is one of the commonest of Indian grassess, and for this reason a detailed betanical description is quite nunecessary here. It abounds almost all over the Presidency and a by no means confined to Southern Guparat. It is the principal grass in natural pastners (lurans), over Western India, and is intentionally grown in many cases for its:

high nutritive value as folder. It is, moreover, a fairly good grass for howns and is used as a treading grass along the sides of drain. In fact, it is only in cultivated fields that its presence is undesirable and it can be termed a weed. It is used by Hindus in the worship of the God Ganesh.

Like so many of the genses which figure as serions weeds this is provided with a system of underground stoms, and long numerous fibrous roots strike from each nole, going very leep. This goes on until a patch or colour of the weed is formed, with a depth of from eighteen inches to two feet. There are two distinct types of plant, one with a much thicker stem, and broader leaves than the other. The former is much more regions and more expalled of extending its range than the latter.

The plant, which is perennal, flowers as cirly as July and has probably only one flowering season, though this is not at all strictly defined nuder ordinary conditions.

The erwhestion of the weel is deficult. On account of its very thin stem and very long roots, if an attempt is made to pull it up, the underground stem invariably breaks off. Some portion being left, new plunts are produced. The only method of dealing with it is to work the soil very deeply in December in the case of black cotton soils, just after they begin to crack slightly,—or in Februry and March in jorab or bears soils. The network of underground stems is thus broken to pieces directly or indirectly, by the plongh. The pieces will dry and lose vitality in the hot we there, and if the process is mintained year after year, the weed will gradually disappear. The annual expendition required will be from Rs. 6 to Rs. 7 per acce. It is of course, more effective to dig over the patch with a pickayo in March or April, but its much more expensive.

Khaca or Linda ( Andropogon intermedius. )

The lotanical characters of this grass, which is essentially a weed of rich soils, are very well defined. The roots are fibrous and penetrate the soil to a depth considerably over six inches from their point of junction with the underground stem. The underground stems are often from three to five feet long, and are stout, flattened on one side, with very short internodes. The terminal point of the root is very strong and pointed, and very sweet in ta-te.

The stem above ground is shouthed with the petroles of the leaves which latter have very short bundles. The leaves themselves, are

narrow about one foot long and a quarter of an inch in diameter at the middle. The inflorescence forms a praicle three inches long, the spikelets being purplish green in colour. The flower has no true permuth its pluce being taken by glumes. The fruit is a caryopsis.

It generally occurs, like the two grasses previously considered, in nitches and in fields, -but soliting plants are not nucommon. It is widely distributed in the Bombis Presidency in all classes of soil, and under all the normal climitie conditions. It is a perennial grass growing to a height of about three feet, with, as nireally indicated, strong underground stems. Its habit differs from dablide in the growth of the underground stem being more horizontal and constructing a network as it develops. The growing end of the underground stem curves npwards with a pouted end and gives rise to a shoot. At the same time another branch is developed underground at the same point of the stem. The foliage aprings directly from deeper layers of the soil than in the case of dablido. It is, on account of this manner of growth, more difficult for new plants to arise from the nodes in the underground stem but they are produced very easily from its growing point. The shoots given of by the unlerground stem of Lhaza are much more numerous thin with dabldo. The network of roots extends to a depth of from two to two and a half feet.

#### It forms a useful thatching grass.

The most practical and effective methods for the removal of this weed are practically the same as already mentioned in the case of dabbdo. The most complete and effective is the removal of the whole plants by hand digging. Next to this comes the nice of the iron plough as already described. It will approof the underground stems fairly easily as they are always much entangled with one another. They are, however, much more brittle than those of dabbdo, but have less power to revue if once exposed on the surface. Light and air are required by thus grass, and hence it will be discouraged by the growth of ripid shady crop. Dainings will help matters and the avoidance of a swampy or even very mosts condition in the soil.

#### Gunderdo or Lowala (Scirpus maritimus, )

This is another weel, of habit closely similar to those already discusion. Its stem is agin partly subterranean and forms what might be called himomes from these branches are put out, and in their turn give rise to independent plints. The aeral portion of the stem is solid, angular and unjointed. Thus, as is usual with members of the order Coperaceae, is the flower-bearing stalk which is closely encircled by sheutung leaves. The leaves nearly approach the flowering stalk is height and are leathery in texture. They have an ligule. The inflorescence is a compound spike, while the flowers are perfect, arising from an axil of three bracts or glames. The fruit is one seeded and indehiscent, and the contained seed is black, shiny, round and about as big as a poppy seed.

The plants flower in from farty ta forty-live days from sowing, and the seeds ripen in about sixty to eaxly-live days. The effect of the plant is very similar to that of the grasses already described. It forms a tangled mass of underground stems, extending to a depth of eighteen inches. This mass is more like an underground mat, impenetrable to the roots of a growing crop.

The plant has, however, its local uses. The roots, for instance, which are fragrant are used most extensively in scenting hair oil, and also in the religious ceremonies of Huchas. They are also employed as an acting-eat in the treatment of swellings,—and are likewise prescribed as a directic. The leaves are used in the preparation of mats, and baskets but the labouring classes.

Wherever farmyard manare is applied, these plants of gunderda appear. This is due to the practice of putting all the weeds in the manure pit, which of course ensures that seeds are varried with them. The seeds of this plant do not easily rot, remain capable of germination, and hence cause the spread of the weel. This indicates a danger which is not always sufficiently considered, and it may be, in spite of the apparent waste, that the best way of treating gathered weets would be to him them. It has the greatest chances of becoming established in the irrigated areas, as it is extremely partial to most and even to swampy laad; owing to the rapid growth and fruiting of the plant, its spread is very rapid if once it gets established.

The recognised methods of dealing with this weed are the same as those already indicated for the grasses previously dealt with. If land he badly affected, it is essential that arrigation he avoided, and it would often pay to leave such land fallow and repeatedly plough it word, and collect the roots and rhizomes after every ploughing. A crop of same, in the meason, which will crowd out the weed will probably also do good, especially if it he ploughed into the land, and the exposed stoms and rhizomes collected at the same time. These are, however, little more than suggestions, as experiments have not heen undertaken on the subject.

Jawasa or Camel thorn( Alhagi maurorum ).

This is the first leguminous weed which has been dealt with in the present paper. It forms a thorny shrub, which yields 'Persian manna'

by merely shaking the branches. The leaves are alternate, with stipules, arising from the axil of the spine. The calve is monosepilous, and the carolla that typical of the papilionacene.

It is found generally in black soils, in fields, especially in the lowlying area near the hunks of rivers. When found in light soils it priticularly occurs where there is a bed of Landar (nodular carbonate of lime) underlying the soil. It occurs extensively in local patches in rice beds.

The camel thorn, as it generally occurs, forms a perennial shrub ground to a height of from two to three feet. The plant branches freel, and quickly cotters a considerable area. Owing to its spiny character it becomes a missinor, and men such animals are often injured by the spines during the rice packling and trinsporting asson. The seeds are shed before the measson, but few of them germinate during the succeeding wet mostlis. What plants do grow, are generally evaluated in the succeeding generalized operations.

The senal parts of the plants die off early in the rains. The roots are very strong and deep and generally penetrite till they find underground water. The plant is, however, very senitine to waterlogged conditions, when he stem and branches wither and die off. The root will retau its artitly, however, for a long time, and throw up new branches when dry weather arguin appears.

Even this thorny shrub is of considerable local value. It forms a very fine hedge if kept to strict control. When out down it is one of the favourite materials to form cartains with water dripping over them, for cooling bouses during the hot dry weather.

Where land can be inaudated during the rainy season, such insudation is very effective in destroying the plants. If the water is kept on the land for three or four days, the part above ground will decay, but it takes much longer to destory the vitality of the roots. Of course the application of the rub process to a patch where it occurs is very effective in removing it or destorying the seeds. But naturally, this process can only be applied to a small portion of the land.

The caltivators dig it out, as a rule, to a depth of nine inches, but this is not an effective exadication, as the plant comes up again from the deeper portions of the root left in the soil. The use of the iron plough at this depth is likewise not permanently effective. In fact no method is known of getting rid of this noisons weed, except digging out with a pickaxe or crowbar to a depth of there feet.

#### Dhudi ( Erogrostis interrupta )

We come finally to the sixth weed of the present series. It is again a grass, very common not merely on the typical soils of Southern Gujarat, but on lands of all classes especially in low-lying damp places.

Belonging to the same genns as the Dabhdo, its botanical character is closely similar to that weel. Its unforescence is, however, n panicle whose branches rising from almost the same spot give the whole a somewhat inticalate appearance.

It is an annual plant, growing to a height of two to three feet. At the break of the mains, the seeds shed in large numbers at the end of the previous riniv sersons, germands and grow very fast, each plant striking hundreds of long fibrous roots to a depth of four to six inches, so that the soil becomes "root bound." The roots of the weed in this way entaugle and choke up the roots of the crop and checks its growth when young.

The weed flowers in September, and seeds in October. The seeds are very small, and retain their vitality until the following miny season.

This grass is not considere I a good folder, but cattle will eat it when other food is not available.

Being an annual weed, the method of dealing with it would seem to be to require clean cultivation as a whole so that the plants never get a chance of seeding, rather than any very special method. To interculture the crop on the land as soon after the break of the rains as the soil and crop allow this to be dene, is obvious as a remedial measure. The cost per acre of such a hocing would be from 12 annuas to Re. 1/-.

# The Cultivation of Mangoes in the Maldha District of Bengal.

В¥

#### S. G. Sharangpani, B. Ag.

43 HE information in the following article was collected during a short which I had the opportunity to pay in Fobrany 1911. Though only a few days in the district, I took the chance of visiting a considerable number of villages in this, the most famous mango district of Bengal.

The district of Maldah is divided into two nearly equal parts, which present different characteristics, by the river Mahananda and Maldah town is situated on one of its timularies the Kalindri. Hence the soil at Maldah is low lying recent allumina curiched by annual deposits of sit, and its fertile soil is therefore well adapted for the cultivation of the crops commonly grown viz., rice, mulberry, indigo, and mangoes.

The profits from the sale of magoes, as well as improved facilities for transport which have recently been introduced have encouraged land-owners to cultivate mangoes in all the parts of the district. Every plot of land sailable for the growth of mango grafts is planted with them, and tracts of land formerly growing ordinary rate or winter crops have in recent years been converted into mango orchards. The cultivation of milherry gives a curious aspect to this part of the country, is the land has to be artificially raised to the height of \$6 to 10 feet to prevent the plants from being destroyed by the annual floods. These raised lands are now being converted into mango orchards.

As the mulberry fields, as well as tracts of land growing ordinary rate or winter crops are gradually being converted into mango orchards, no special preluminary cultivation is required. Manner is need only on mulberry lands, the rate of manure being 750 to 900 mds\* per acre of well rotten cowdung. The mulberry fields receive two or three plonghings. Before planning the mangoes into their final pits, these ne dag about two feet deep and then the grafts planted are transplanted into them. No manue except fresh earth from the banks of the river is given. The mangoes are generally transplanted just when the miny

<sup>·</sup> Maunds of 80 pounds are meant in the present paper.

season is nearly over. Vegetables, ans paddy, mustard, mulberry and turmeric are grown in the pluntation while the trees are young. Preliminary cultivation i. o. ploughing, burrowing &c. is given to these crops and after the fruiting time is over the field is ploughed once or twice.

The varieties commonly grown are Fuzlec, Gopalbhog, Krishabati, Brindsbance, Lambabhaduria and many others. As this was not the casson I could not get the specimens and hence the details as to the size, shape, colour, keeping quilities &c. will be given in a later paper.

Formerly manages were transplanted at a distance of twenty to twenty-five feet, but now the entireators are coming to understand that sufficient space must be left between plants, or else, on account of the struggle for evistence which goes on between the plants, the weaker no checked and hence they give less yield. Now the distance left between manage plants is not less than forty feet. The cultivators acknowledge that thus they give a better yield and the plants last longer. They generally finely their life-cycle in fifty to sixty years.

Many trees do not grow true to the parent if propagated from seeds. Thus the tree grown from the stone of the Goyalthing mange seldom produces a Gopalthing. Hence trees of special merit are produced by different methods of propagation such as inarching, layering, budding, grafting, since the trees are true to the scion or bud used.

The mole of propagation in the case of the mange almost always resorted to in Maldah is inarching.

Stones are sown at the time the fruit is in season and the plants raised from them are parted off into single point, to be marched upon the setting in of the rains in the second year after. At the close of the rains the union between the graft and the stock is complete and the plants are then separated and thoroughly c-tablished. The separation is done gradually, that is to say, the stock is not separated from the scien at once, but a little of the branch only is out, then ufter three or four days a little more, and so on till the stock is wholly separated in about two weeks.

When inarching, by means of a scatledding, a large unmiter of seedlings are tied on to a single tree. All the pots are given water regularly; but if the grafting is done in the rainy serson no irrigation is required. The grafts are ready in about three or four months and are transplanted in the fields during the next measure. If irrigation facilities are available the cultivators graft at any time of the year,

still those grafted during the latter part of the rains when the heavy showers are over, they say, are better and more reliable. This is what we should expect, as, it being the growing time, the sap flow is free.

I saw here that some of the stocks were grafted high up, as high as five fect or even eight feet. These grafts they said were intended for places which are waterlogged. Such grafts are planted there of in waterlogged places) and earth heaped up round them till the level of the soil is about ax feet from the pont of minon.

The area of mange cultivation in the Maldah district is estimated at about 50,000 acres, and the usual rest for such land is from three

to six rupees per acre.

The mangees here, they say, suffer from a fungus disease. This attacks especially old and jungle plants. The leaves from the top of a middle aged tree begus to drop down soon after the rains are over and gradually the plant dies. This disease is contagious. Neighbouring plants are attacked and they undergo the same fate. Nothing however is known as to its cause.

In marketing the crop, these fruits that are not immediately disposed of are placed separately side by side on mange or other leaves on a raised platform called a *Mackan*, and if this is done carefully they keen for some time.

The profit of a good mango plantation is estimated on an average

at 300 to 600 rupees per acre.

Dr. Erteja Husen, Post Kotwali, District Maldalı, is experimenting on mangoes. In order to give the grafted plants good support he does as follows:—Eirst of all, the place where the grafted plant should be is selected. There two stones of ordinary mango are sown in the fruiting season. A third stone is sown in a pot, On this is grafted (inarched) a good variety, when it is a year old. After it is established, the graft is placed between the two seedlings in the field and grafted afterwards with them. Hence it (the graft is seedling) \* gois

#### \* A & B .- Ordinary mango seedlings.

C.—Ordinary mango seedling already once grafted on to a good variety and placed here between 'A & B' for being grafted again with them to get more strongth and nourishment.

The two marks on A & B indicate the place where the ceedings will be cut off after the thorough establishment of the graft 10.

nourishment from three stocks. Similarly he is trying to import the flavour of camphor, rose etc. to the mangoes. For this he selects a three or four year old grafted mango plant, makes some incisions with a chisel, puts in camphor or any scent he wants to import to the fruit and ties the spot with a cloth, watering it overy day.

In preliminary cultivation, manuring, irrigation, grafting, praning &c., the cultivators do not seem to bestow any particular attention on the mango plants and yet mangoes of the finest description are produced at Maddah; but to what circumstances the superior merit of the fruits raised is attributable, whether to any peculiarities in the soil or climate or to some particular mole of cultivation, it seems hardly possible to decade. When removed to other localities for cultivation, even under what would appear to be the most favourable conditions, the tree produces fraits of sumewhat interior quality. These seems no doubt but this is due to the presence, in the air, water or soil, of natural conditions favourable to the production of a speciality. We all know that this peculiarity in the excellence of fraits in favoured localities is neither confined to the murgo nor to India, but is also found in connection with most fruits in all parts of the world.

#### A Note on Chikko\* Cultivation.

BY

# V. N. Gokhale,

URING the last summer vacation I paid a visit to the Thana District which is so well-known for its garden cultivation. My first intention was specially to study and observe the methods there in nee in the cultivation of plantatian and mangoes. But in the course of my stay, I had the opportunity of seeing and going closely into a much more localised culture, namely that of the chikho, which will be found, I think, to have considerable interest. The chikho plant itself was a novelty to me. I had, of course, seen it here and there in private as well as in botanical gardens, but never as a regular organised production for the market. Obviously therefore, when I found the whole of some acres of land wholly cultivated with this fruit, my interest and curiosity was aroused.

<sup>.</sup> Achras Sapota.

The plant itself is a somewhat curious one. It branches very thirty from the very bottom right to the top. The branches arise at right angles and are arranged in a circle thus giving the appearance of so many spokes of a wheel. They are long and typering, crowled with leaves not much different from those of thitaphal or custard apple in shape or sure. But the perulanty is that the leaves also are found in whorls, forming clusters round the branches. They are always green and sluming. The inflorescence of this plant is also very curious. In general appearance it re-embles that of the Bakul tree, Minusops-Eleng but the flower is not fragrant at all. It is also not a showy one as it is generally burned in a mass of leaves. The flowers also are all ways found in clusters and mostly they are a cillary. The tree is sleader and usually from ten to fifteen feet high. It grows very slowly, and spreads, for its heighly, over a considerable crea.

As I have already observed, the inflorescence of this tree is axillary, and hence the fruits are to be found also in the ardis. The fruit is very peculiar in appearance, if not in shape. It appears like a ball made of saw-dust. The raw fruit when pierced with a nail of a finger gives out a stocky white jales and when eaten in this condition though sweet it causes a choking sensation. When fully ripe it becomes darkin brown and the whiteness of the fieshy matter inside also undergoes a slight change. To the taste it is very sweet and delicious. The outer cost or tests is so thin that it can be easily eaten along with the fiesh without affecting the taste. When the fruit is cut, it can be seen to be divided into ten to twelve parts or septas though no such trace is seen from the outside. In the centre of the fruit we find three long black albaminous seeds.

The plant is proprieted in two ways. Fratly by means of seedlings and seconly by means of layerings. The plants obtained from the second method are stronger and beathier; and, moreover much time is required to raise a plant by means of seedlings. The plant I saw growing very well in the red sandy soil along the sea shore. It can also be grown, as we know, in the black alluvial soil of the Deceni. But it seems probable that the red sandy soil and the sea breezes have much to do with the exceptionally successful growth of the plant.

When the plant is old enough to be removed from the pot a small pit two to three feet deep and a foot or two wide is made. Having been filled with the soil mixed with sheep dang manner, the tree is then planted in the hole. It requires watering every day till it is old enough when the water is given every thand day. It is better to add manure every four or is it menths according to the quantity of manure

applied on each occasion. The pit is also dug up every time and the soil so kept light and porous. The pit is also made wider and wider very time so us to give greater space to the roots which grow almost horizontally. The biggest pit found was six feet in dimeter. It is said above that sheep dung is applied as a manner but, beyond this, it is actually found that much benefit is derived from the application of fish manner.

The plant generally yields a bumper crop when it is five years old and keeps it-elf in full vigour till it is ten years old. Nearly a thousand big fruits are obtained from one single plant during the season which generally lasts from November to March. The fruit is as big as a small orange. In the mine season we generally do not find fruits on the tree, though a few exceptions are met with. The fruit is in great demand in the Bombay market, and fetches a price from twelve annas to a rapee and a half per dozen. There are two varieties of plants, one yielding almost round fruits (as big as small oranges) and the other yielding egg-shaped fruits. The latter is valued much more than the former, the actual reason not being known.

In addition to the fruit eight to ten entitings can be obtained every year from each plant. They are generally obtained from the bottom branches which spread almost on the ground. The cuttings also bring a reasonable price. But one can be sold for five to eight rupees, thus giving in all fifty rupees on an average. Thus a plant from the time it is fluly grown) pays nearly a handred rupees a year and that constantly until it is ten years old at least. This is the information given me by local entityences.

We must at the same time consider what would happen when we have to make a big plantation. A square area of an acro can hold nearly a handred and fifty tress planted at a distance of twenty feet, though fifteen feet is the distance that is generally kept. In the latter case, however, there is much crowding when the trees grow bigger. In the early stages plant ins can be planted between every two rows of childs plants so that wider planting does not result in serious loss. The plantain trees are cut down when the childs plants grow old enough and when the latter appear to be obstructed by the growth of the plantains.

From the above facts it would seem that the cultivation of the chikhos is at least equally profitable with other garden plants such as mangoes, plantains &c., and is worthy of close attention both from those who are merested in the development of our Indian fruits, and from those who are seeking a profitable investment for their capital in suitable places in Western India.

#### Plantains Containing Seeds.

The Editor.

Agricultural College Magazine, Poons.

Dear Sir,

I real with great interest the article by Mr. G. B. Patwarthain on "A case of occurrence of seeds in cultivated pluntains," Ho writes there that seeds are scarcely found in cultivated pluntains but I list observed that there are many seed rarieties of pluntains under cultivation in Bengul. At least I found three such varieties in the Narayangan market while on tour in Lower Bengul. The following varieties were obtained and examined:—

- 1. Zama kola (largest)
- 2. Tala pub ( mediam in size )
- 3. Kolmri (small comparatively)

Of these the last variety is the sweets-t and is extensively grown. Seeds are found in all the above varieties. In Zama koh the seeds are harder, larger in size and are in great numbers. Six rows of seeds were quite distinct in the flesh. In the second variety the seeds are rather small and only five rows were distinct. In the third variety (kaburi) the seeds are small and few and were found scattered very irregularly in the shalle portion.

Yours faithfully, G. K. Kelkar, Assistant Professor of Agriculture.

#### Veterinary Notes from Poona.

BY

## F. Gracias, G. B. V. C.

#### I TRAUMATIC PERI-AND ENDOCARDITIS.

ISTORY:—As all debilitated buffalo cow was brought into this begins in the control of the contro

STAFTONS and TARATHENT :- The naimal was certainly blown but the distension was not of a nature to require immediate sarrical interference. Therefore after evacuating the lowels and giving an enema. a drench consisting of oil, carminatives and stimulants was administered. The same drench without the oil was repeated in the evening and the next morning, when she looked decidedly better. The distension was considerably reduced and the dung and urine were normal. Her appetite had also returned by this time, but she was kept on low diet such as bran mash, and a limited garatity of hay was allowed her. By way of medicine an occasional stimulant dose was given her and tonics administered twice daily. For about seven days she seemed to be progressing favourably and was in fact getting into condition when suddenly, on the morning of the twelfth day, the nuimal was seen to be considerably blown, rumination suspended, food refused, muzzle quite hot and dry, and the animal seemed to be in excessive pain. Her head and neck were extended. The respiration and temperature were also remarkably increased, the latter being  $104^{\circ}\mathrm{F}$ . The pulse was also markedly changed.

On the evening of the eleventh day she had been to all appearances, well: in fact, were it not for the sudden change, to which also mecumbed, I entertained full hopes of discharging her cured in a few days more. Towards evening of the twelfth dry, she looked quite anxious, her pupils were dilated, and the head and neck more protuded. She seemed to he really sufficienting: there could also be no doubt from the low groans emitted that she was in great prin. The extremities were now cold and the pulso more feeble and irregular. The irregularity of the pulse with coldness of the extremities, was, it must be admitted, a singlecous symptom, but not sufficient for any one to form a correct dagno-is of Peri and Endocarditis, although it is said to occur frequently in bowness and particularly in dairy eattle.

The writer has never had the good fortune of seeing more than one case and that while a student at the Bombay Veterinary College. He has great doubts still if he would be able to diagnose a similar case correctly. This has been a case of the utmost henefit to him however and he hopes he has learnt a good deal from it. He therefore trusts it may prove of interest to his professional brethern and those interested in cattle generally, who may not have had the good fortune, like the writer himself, of having treated a case of Tranmatic Peri and Endo-carditis.

After an ineffectual trial of carmmative stimulant treatment, stimulant tones with an occasional does of a selative mixture, were administered. Congees had also to be given her as she refrained from taking any fool. On the thirteenth day, her midday tempenture foll as low as 95.6° F. It was deemed necessary therefore to give her a subminance injection of strychnine which materially helped to prolong her life by a few hours. The temperature at 6p. m. was a shade better than a moon, but the other symptoms were the same, if not aggravated. The end was as could be seen, quite near, another injection of strychnino was given at about 6.30 p. m. and the unimal died at about 9 p. m. of the same evening.

Post nortenapreabances:—As usual a post morten examination when held on the carcase and as this was a case which remained nn, diagnosed and interesting to the very last, the autopsy was therefore very carefully made and its brief description may, it is hoped prove,

interesting. On ripping open the stomach the first thing noticed was a continuous escape of gas. The stomach was by no means ent necidentally that is certain; on close search the reticulum was found punctured; this of course explained the whole case at once. The thorax was next opened and it was found to contain a dark coloured fluid. The whole of the pericardium was highly influend and at the point of puncture it was very much thekened. The sec contained a little of this dark limid but it was also mixed with a little pus. The pericardium was next removed and the foreign body, a needle, which measured about three inches long, all bent into different angles, was discovered in the miscular wall of the right ventrally, where a comparatively large cavity was formed, which contained a small amount of foul smelling pus. The endocardium appeared to be highly congested too and traces of thickening were tound scuttered about here and there.

#### II LACLESTION OF THE PERSONNELS.

The subject is a roan country bred mare, standing about twelve hands high and about four and a half years old. She belongs to a poor cultivator of the village of Bhopura, about five miles from Poona.

History:—This pow was let loss as usual in the morning among the other annuals of the village. Two buff lo hulls, one of them a fierce ill-tempered linte, started a fight between themselves; the other a quiet creature, atraid of the wild berst, started running for its life. The former chased the latter some distance and finding this mare in its path, weaked its vengeauce by going her about the middle of the neck, terring the skin, muscles and the occophagns, the trachea just escaping the bad gath.

The poor owner, quite finstered and worried, brought the animal to this hospital for treatment at about 8 p. in. of the same day.

Symptons -- Nobody could mistake even at first sight the injury to the gullet. The chewed food could be noticed escaping from the open wound; besides a great deal of it was ledged unside the sleep gash.

TREATMENT:—The animal was secured in the stock and its mouth kept open by means of a balling iron. A gum elastic catheter was then pa-sed into the occophagus as no horse probang was available. The wound was washed antiseptically and as the lacerations were extensive and iteep, the skin wound was eularged by about three inches. All loose tissues were removed and the wound rowashed. Unfortunately

however just about this time, the balling non sumpped, the catheter was consequently partially chewed by the animal before it could be removed. Owing to this mishap I had to cast her the following morning substituting a bullock mouthing for the balling iron and using a fresh catheter.

The ocsophagus was so much torn that had it not been for tho escape of saliva and food, it would have been practically impossible for any one to recognise it. Suturing the tern lips was simply out of the question. The toru edges of the muscles were carefully sutured with catgut, and Iodine solution, of which I shall have to speak later on, was smeared all over the wound. Tho skin was then sutured with flax interrupted sutures. Cotton wool saturated in the above mentioned solution was placed on the wound, the neck bandaged, the animal allowed to use, hand rubbed, walked about for a few minutes and her head secured in the stall. A backetful of boiled water was next given her. She was given milk and thin wheat grief which was continued for five days. On the sixth day the bandage was loosened and to the greatest surprise of us all, the external wound had apparently healed by first intention. The Iodine solution was repainted and the neek rebandaged. She was now fed on a bucketful of rice couged twice daily and 10lbs. of lacerne. On the 7th day the peny unfortunately broke loose, tore off the bandage and scratched and mutilated the nearly healed wound. The muscular wound had by this time completely healed as norther food stuff nor saliva escaped from it. The external scratched surface was washed in the usual way and dressed with Indine. The mare was given on the 10th day some hav and fine toward stalk called 10 vernacular "Kurba" which she are veracionaly and with impunity. She was discharged circle on the twentieth day with the advice not to feed hereon stout kurba for at least another fortnight.

The writer, as will be noticed, has all along made use of Ioline solution only, in the treatment of his case. A fair trid was given it in the treatment of wounds, and be must say with pleasure too, that the ancess he has achieved within the last sax months has been beyond his expectations. It is therefore his intention to plue this simple recipe before his professional brethren in order to tast for themselves its real value. The solution is made up of equal parks of Tr. Ioline, Spt. Rectified and distilled water. Fair sized timours have been removed and treated with the same solution with the remarkable success in the following



A TYPICAL YOUNG BULL SUITSHE FOR BRYFINGS IN PRAST. ASE 12 MONTHS

way:—The hair was either shaved or clipped quite short and the part washed with warm water and soap and dried. A clean incision was then made and the tumour carefully removed. Inacmorrhagm was arrested as usual and a thin cost of the solution printed inside the wound. The lips were then carefully submed, the solution ugain applied and Collohou need to caver the wound. The case was then left alone for four or five days and the dressing reapplied. In from ten in fifteen days the patients were always faund fit for discharge.

#### Cattle Breeding in the Karnatak and its Pessible Improvement.

h5

### R. S. Hiremath, L. Ag.

JIPHE Amerimahal (Multa), the Khillari, and the Krishnavalley hereds and their mixed progeny form principally the cattle of the Karastak. Pennle make nu scruples in mixing these breeds freely. Village cattle are left entirely to the course of nature without any control and without any of these artificial restrictions by which alone a bread can be saved from admixture, and usually from deterioration. Seldom is any selection made of breeding cows and balls concerning their fitness for producing a strong and healthy off-pring. Any cow, however deformed or diminutive, is allowed to breed. Nor are inferior and imperfeet bulls generally castrated in order to prevent them from acting as sires and perpetuating their shortcomings. The common practice of driving all the village cattle, male and female together, in one herd, leads to indiscriminate breeding. Most village cows are so small and of such little value that the owners do not think it worth their while to get superior bulls to serve them. These superior bulls are not very plentiful, and when available have to be paid for service, which payment the owner of the puny cow naturally gradges. In many instances, before the owner makes up his mind the village bull forestalls him. Such are some of the difficulties which lie in the way of village cows getting served by good bulls. Absence of such bulls is one of the prime causes of deterioration of the breed from generation to generation.

It has seemed to me during my travels in the list two or three years that it would be an excellent thing if two or more villages would co-operate and subscribe for a special superior breeding bull suitable to the locality. It will then be a common property of the villages, and being allowed every homes and tended by one and all would be in excellent condition. In certain psychosa localities special breeding bulls or be-influoes are kept bounded for breeding, a fee of a half to two supers bring charged on each own served, higher fees bring sometimes demanded. In many places no special breeding bulls are thus maintained.

In spite of what I have already said, and which appears to the vast majority of village cuttle, there are in many parts a good number of cattle which are carefully kept and home fed. For these, which are possessed by many well-to-do cultivators, spaced superior breeding bulls should invariably be secured for service. Such berls are Lept in open enclosures fenced with them, generally away from villages, and thus always graze away from the village cattle. They can thus be excluded from inferior village balls which are not liable to mix with them. Such a berd should have its own special superior leveling ball sometimes selected in the same herd, but more often from some other berd to present in-and-in breeding. As the bull grows old and deficient in rigon, a young one should be similarly released to take its place. As the young one is likely to act as a teaser, it should not be brought into the berd till the former one is sufficiently unfit. All the mulformed and pury balls should eather be castrated or separated from the general Lerd of cows. Early cartration does not do any harm as proved on the Poms Farm. They are still proful for work and their flesh is improved. They become more deale and munageable than the more cartrated mea

Hiring a limited number of thesp tillage cone with a pure bred ball is one way of framing new and improved brele among villages, but this may take too to treat y sure to trake the standard of the progray to the larger size and value of the pure bred minuals, even if it is then done. It is will that generally the progray sensol in descent attains much of the quality of the size of the pure bread, or even if the traces of maternal defects should linger in it, an animal third in descent, almost certainly, ethnic almost that studend of size, slape, valour and efficiency. A transformation, therefore, from the pure village to any other good bread, if it is wished, may in this mature by or plated, for most practical purposes, by our good ball purchased by the public in common. The following table may illustrate what is asserted:-

A good Karnatak cow+puro Mudla hull=half Mudla progeny first in descent.

Then, half Mudla cow + pure Mudla bull = three fourth Mudla progeny second in descent.

Then, three fourth Mudla cow+pure Mudla bull=seven eighth Mudla progeny third in descent,

By going on in this manner a cow or bull very closely similar to the pure bred sire, may be brought into existence after the lapse of a few years.

In breeding, the villagers nover aim at developing in the young one any particular aptitude or special fitness for draught, for fast trotting, for carrying loads, or for milling. They breed at random and wait apon nature, never thinking of assisting her in the least. They rarely endeavour in breeding their cattle to produce animals of large size, strong and shapely built, comely limbs and attractive colour which are valued highly in the market.

The following are considered good points in a breeding bull :-- A long and stretching frame; a good height; a long and tangering head with broad and prominent forehead; small but sound, clear and bright eyes; small, active and erect cars; thin and gracefully set horns, the difference between their thickness at the base and at the end heing small; neck of moderate length, full and muscular, and gradually tapering towards the head; hump, small and well-shaped; dewlap, thin and short; full, broad and spacious chest; well-formed strong shoulders and hind quarters ; strong and well-rounded ribs : level back and broad loins with narrow flanks ; cronp, level, whip-like tail; augs, well projecting so that the dang may fall clear of the body; sheath with little or na pendulons growth; legs of medium length and well proportioned, having strong and fairly thick bones, and concording in anovement and not turning sideways or brushing against each other; fetlocks, short; and boofs, hard and small with equal halves, having a very narrow cleft between ; skin, horns, muzzlo and hoofs black; hair grey; body compact; teeth and testicles sound; tho animal, of good temper and free from hereditary discases.

The above points have reference to beauty, strength and endarance. Though it is difficult to find out an animal having all the above mentioned points, still attention abould be paul in choosing an animal having a majority of these good points. As "the bull is half the herd" his defects are much more serious than those of the cow, because of the number of animals of which he can be the father.

By this I do not mean that no special care or attention should be paid in the selection of a cow. The mun points to be looked for in cows are a good size and longit, shapely head and horns, broad hips and loins, large and well-developed breeding organs, a nice colour and a good temper. In the case of dury cows, besides the above mentioned points particular attentions shall have to be paid to the udder, teats and milk veins. The udder should not be very pendant but should be capicions, wide from side to side and extending well forward and backward and well-filled between the tests.

Teats should be handy, of good size, regular, squarely placed and wide apart. The milk tem should be of large calibre, tortuous and much munified.

In the case of draught animals, thick short, and strong neck, broad chest and loins, short and bony legs, well-formed but massive shoulders and hind quarters, have to be taken into account in addition to the general observations. In animals intended for fast trotting, the requirements are different and to a certain extent quite the reverse of those fitted for heavy draught. A long and comparatively than neck, long and thesk legs with small fethods, and clear tather deep than wide, shall have to be observed. In the case of pack-animals, a strong cheet and loins, a level and well-brick with strong vertebrae and well-developed shoulders and thighs, have to be considered. So in the selection of animals for breeding the most important thing that has to be borne in mind is the uninose for which the animals are intended.

One great evil which is very common in the Karnatak is premature breeding among the young stock. Calving by young heifers entails upon them serious after-consequences. The bodily development of the animal receives a sudden check and a diminished size is the result. The arrested growth of the bones makes the animals work and lean. They seldom regain their condition and are reduced for life to a lower standard of strength and efficiency. The calf suffers even more than the cow. Ill-nourished before birth, the calf is likely to remain half starvel upon the mother's insufficient milk. The immaturity of the hull affects the vigour of the calf likewise. Thus, as the result of ill-assorted and injurious coupling of immature animals, stanted cattle come into existence.

Looking to our climatic conditions the season of breeding cattle stands prominent to receive due attention. There are three different periods in which cows are mostly found to come in season, (1) April and May when the early showers fall, (2) October, November, and December when the pasture is at its best, (3) January, February and March when cattle get fed on the refuse of the threshing floors (yards). The first period is not advantageous as the time of calving in the case of cows so conceiving happens to coincide with the following hot season. when the cow and calf are likely to suffer from scanty pasture. second period is the season when cattle get into a condition propitions for breeding having had time to recover from the depressing effects of the previous summer by revelling in pasture which is then in its mo-t ebundant and vigorous growth. Impregnation at this period has the adventage of good season while the cow is in calf. The calving time will elso fall in the early part of the succeeding many season. The third period is not on edvantageous one es the dry weather follows immediately after conception.

In connection with the subject of breeding, there ere certain facts which are very highly valued by experienced people and hence deserve to be meetioned here. These are (1) the age of the first conception of different cows, and (2) the interval; which they pass in calving afterwards. Some cows take bulls before they cut two teeth, others at two and some others later. This is rather attributed to the family to which they belong. These families are classed as (1) those calving annually (बर्द माहि). (2) those calving biennially, (3) those calving triennially. In the last two cases the intervals are sometimes narrowed more or less within a limit of six months. Cows of the first class take bulls at about two teetb (one and a half to two years), of the second class at about four teeth (two and a half to three years), and af the third class at about six teeth (three and a half to four years), provided no exceptional circumstances, as a season of drought, influence and alter the natural conditions. The most prevalent class is that af cows calving annually. making selection, experienced purchasers invariably prefer tricinials, if they find them, and are willing to pay higher prices for them. Both the culf and cow of this class are larger, better mule and stronger than the other two, and the bennials are better thru the annuals. The reason of this is obvious. The milking periods of these classes of cows also vary, those calving at longer intervals continuing in milk also longer. Making allowance for good or hid keeping and individual peculiarities, annuals entimen milk from four to sex months, blennials from twelve to sixteen months and triemrals from twenty one to twenty seven months. Calves of the latter two classes are noorished longer upon the mother's milk and grow better. The long period for staffer calving especially after they run dry, enables them to regum their strength and vigour lost at each pregnancy. Annual cows, which usually suckle their cules from three to six months, are sometimes lindle to a double draw, by the calf at the foot and the developing fectus in the nomb leaving no time to repair tho loss. Thus in breeding, the selection of the family is of intmost importance in order to get strong animals.

The age of the bulls cannot be passed over. At two teeth (one and a half to two years), they are active and 'igorous but much less enable of impregnating; at four teeth (two and a half to three years) they are letter fitted for feeundating but are thin and weak. Both these are too young to breed satisfactorily. They will not only suffer constitutionally themselves but also produce a week progeny. From six teeth, (three and a half to four years) up to the age of allout twelve they are of established igour and breed successfully without suffering from constitutional disorders, nod their progeny is also strong and of good size. From about the age of thirteen they begin to decline, and the breeding powers altogether case at about sixteen.



## The Supply of Working Cattle,

BY

#### K. M. Pawar, B. Ag.

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Id and experienced cultivators believe and put forward the opinion that the decline in the productivity of the soil is due to want of good working cattle, and arregularity of rain. In olden times at is said that each farmer had at least two cows of his own which were maintained partly on grazing and partly on the folder raised on his farm. This almost all of them were while to produce their own working cattle and therefore no want was felt. And looking to the previous records of cattle it seems that it has some truth in these statements. Want of cattle means faulty trilage. Heavy out-turns no harvested by proper tillage and by giving a proper amount of manure. And this requires a good supply of cattle. For cattle furn the chief factor in Indian Agriculture, because all the power used on the farm is the hillook power and hence comes the necessity of mercasing oul keeping to eather the place of animal power and hence the question of increasing the working eattle is not of so much importance as is the case in India.

But times have changed here in Indra and the want of cattle is remained felt. The question has become sections that it has become ancessary to necertain the cause of the decreive and take steps to remedy it. For, looking to the experience and remarks of old cultivators, it is clearly seen that the relation between the highest success in farming and the growing of livestock is soclose as to be inseparable. It appears, in fact, that the measure of the success obtained is proportionate to the extent to which livestock is kept and to their quality. It follows therefore that every legitimate encouragement should be given to the livestock industry and that every legitimate effort should be made to deepen the farmers' interest in livestock production. Make it clear to the farmer that maintaining livestock on his farm will increase his profits and promote in many ways his best interests and in ninety-nine cases out of a hundred he will give, at least, some attention to it.

Before looking to the question of taking measures let us see what are the existing conditions, the present breeding centres and the purpose

for which the cattle are bred. The chief breeding places in India are the Gir Hills in Gajarth, the Satpara Hills on the border of West Khandesh, and some places here and there in other parts of the Presidency. The chief requirements for breeding are good grazing and an ample supply of good water. The places must be on a high level and have a considerable amount of shyle. These are the natural requirements. From this point of view the Gir Hills are better off than any other place for they grow better grass and have excellent climatic conditions. On the other hand the Satpura Hills are excessively hot in summer, which tells appose the cattle bally.

The breeds are different in each place. The chief breeds are:-

Gujarath.—The Kankrejt, the Gir, otherwise called Surti, and the trotting animals which are small in size and used round about Some.

Satpura Hills.—The Khillan and the Malei. These Khillanes differ from those called by the same name and existing in the Satara district. They are comparatively light and swift animals.

Other breeds known in the Bombay Presidency are the Hanoum and the Deceams. The Hanoum breed is bred round about Sangli and is small in size.

All of these breeds are used for farm work and generally no disturtion is made between a good trotting and a good working animal. If we look to the breeders here we shall find them without any definite view as to the special purpose for which they are breeding.

Looking toward, Guparath, the Ahmedalad and Kaira districts are well suited for cattle breeding, folder crops and grazing being usually plentiful. Except in extraordmary times as in the last famine period, and when no cattle from other districts intrind there, forage is abundant. In nearly all villages a few professional breeders Rabars and Bharwads are to be found Bullocks for agricultural purposes are reared by the farmers from the time they are a few months old. At this age they are purchased, after castration from the Rabars, many of whom go to Palanpar and Radhanpur Estates where the best Kankreji cattle are to be found and buy them. Khillaries or Charans are the names of the professional breeders in the Satpura Hills.

The breeders as a rule do nothing except producing the cattle. In Gujarath breeders keep up the size of the animal and keep up the typo pure as far as possible. But they do not look to the question whether the animal will be useful for work, milk, or trotting, and if the breeder has any object it is to try and accumulate all the desired qualities namely of milk, work and trotting in the same breed. And hence in attaining all we lose a good deal we might obtain in the capacity for working. As for instance if we want an animal for work it must be heavy and well developed in the hard quarters, of a good stature, and of a docilo temperament. While if we want it for trotting it must be light and alert. This means that the presence of one shows the absence of the other and in wishing to combine these together there is a ten lency to lose both. Hence the first important point is that we must have a definite view before us. While attempting to increase the number we must also pay attention to the quality of the naimal we desire, that is we must see whether the animal is the best type for working purposes or not, in order that we arry have an animal possessing all the liest analities for work. Our aim mass not be only to increase the number but also the quality. The importunce of having parity in the hull is very important. But it is beyond the scope of this small paper and so casaal reference only is made to the subject.

In this aspect however the first and most important matter is the step of selecting a good and pare ball for a breeding heal. Each village should be supplied with a good and pare ball. Then continued selection in the heaf should take place, and the heafer which proves below the mark should be weeded out. Thus we must develop a good head to begin with and then increase the number. It is of no use, in my opinion, to introduce new breeds. The breeds, which we have, in my opinion, to introduce one breeds. If we introduce the Kankreji bullock of Gajarath in the Deccan, it being a delicate animal, will suffer, because the tract is a famine-stricken tract and has not good grazing facilities such as are found in its home, and so on. The Deccan breed, being hardy, on the other hand, is suitable. We must try to improve each of these by selection in its own tract and by using a pure bull.

In order to keep up the purity of a bord we must not allow any other ball in that herd and at the same time so young bull of the same herd should be allowed to remain in the herd. It is a serious mistake to allow young bull to cover the cows. For their progeny is sure to be inferior and unlecalthy. Hence comes the necessity of early castration. There are many advantages of this but most important are:—

1. The heifer will not be covered by a ynung bull,

- The cult will be well developed in the hand quarters, which is essential for good working cuttle.
- 3. The voung bull itself cut work for a longer time without becoming tirel.
  - 4. The bullock is mild and docile.
  - 5. The working capacity of the cistrated animal increases.

These are the preliminary steps to scenar good quality in the stock. But it is necless to have good stock arises proper provision is made for muntaining them, and here the question of feeding comes in. Feeding stuffs are of two sorts. One consists of hallsy follers or "roughages,"—the other is composed of concentrated fools. It is impossible to mutual manuals on the litter wills. For it will be too coethy and the animal will not be system of cuttle demants of the fool supplied. The construction of the system of cuttle demants bulky as well as rich fool, and so the necessity of "roughages" is fell.

Under " roughage," are included all kinds of hulky folders used for cittle. Whence to produce these? The chief reservoirs of all folders are forests, waste land, and the straw of good producing crops, It is clear then that we have to depend on them principally, though not entirely. Now the forests and waste lands being Government property we must leave them asale for the present. Because we do not got access to them very easily and therefore we have to depend on the other resource namely crops which give us folder. Thus the question of growing such crops as will supply the farmer with sufficient food and fodder becomes of the greatest importance. No doubt in growing such crops only the farmer may draw a smaller ancome in the beginning but after feeding his folder to the brestock he will get the same profit as with other crops and at the same time will maintain the furthlity of his land by using the droppings of the Inc-tock. If a farmer keeps at least two-thirds of his e-tate under foller yielding staples there will be a large supply of folder and I do not think that then there will be any necessity to look further for its supply. Euch man raust have a store of folder which will last at least for one year. It is generally believed that a farmer can easily maintain a cow and a pair of bullocks on the land worked by one pair of bullecks on the folder grown on it. At this rate each man will be able to produce bullocks sufficient for his own use. The chief thing is to show the firmer the importance of growing and storing fielder sufficient for his own use and he must have at least one year's store in reserve.

This being done the question of pastures comes in. For it is necessity to have some pastures on which the cuttle may graze. In grazing, they get exercise which is a factor in keeping the cuttle healthy It will be no good to feel cuttle always on raise! folder alone. Because it will be expense o and the cattle will not get sufficient exercise. People therefore may be induced to keep some lands under good grass for their own cuttle. They must be induced to grow and maintain good grass with proper cute of it. They should be asked to give the same attention and cure which they give to crops. Thus I think there will be sufficient supply of folder for each farmer.

After making a supply we must see that it is used carefully. If we see to the daughills we shall find much of the folder wasted and is allowed to rot or otherwise burnt. This shows that feeling is not properly attended to. The annual must be given sufficient fedler at regular intervals. The greatest ears must be taken in feeding animals. For the development of the annual depends on the proper care and fee ling. The follier given to cuttle must be good and wholesome and at the same time must be given in sufficient quantity. It must be well cut if course and long, to avoid wastage. The same supply if used in this way will last for a longer period. Many of the course grasses and straws of crops are wasted only because the cattle do not relish them. But if they are properly treated I thank much of it can be utilised. The kadbi should be cut to pieces and straw of cereals trampled under the feet. These may be sprinkled over with salt and gul water at the time of storing and I am sure the cattle will then cat them, and thus much of the wastage will be stopped.

The second thing which attracts the attention of a minute observer is the fact that the farm preduce is usually sold at a very cleap rate. Many inferior kinds of grains are preduced on a farm, and, moreover, at times much gool grain is inevitably damaged by rain etc. and such preduce is sold cherp in the market. Instead of thus solling, it would often be more profitable to use these inferior materials for feeding the animals with advantage. These will be good matricuts to be fed with rough and coarse fedder.

Many farmers are in the habit of selling their fedder. If the places are at a distance from a market it is sold cheap and when

brought to the market cartage becomes very co-tly. And it is also a troublesome task to dispose of such balky things. It will be better if these bulky things are turned in to small ones and then disposed off. That is if they are fel to cattle and the produce from them if sold will be often for more profitable.

Proper attention must be given to the feeding of growing calves. The feeding of calves at present is ansatisfactory. For care of the calf is taken only for the first year when the cow is in milk. If the cow is not a milking one then the calf is left to nature after the first year, it is left to itself until the end of the second or third year when it is again fed with some care. The calves being left to themselves do not grow to their full development since they do not get proper feed. The care of growing calves is of prime importance and as long as this is not done I think no better results can be expected. But greater attention to the calf, is in my opinion, one of the most important means of increasing the number and quality of working bullocks. Many of the calves die simply because no proper care is taken of them when young and growing.

Then, we come to the necessity of giving good and pure water to the cattle. Generally we see cattle drinking water from stagnant and noxious pools especially in villages depending on well water. If water from such reservoirs be given, the cattle is hable to get many of the most serious diseases from which cattle suffer in the Bomhay Presidency. Severe losses are incurred at times from such waters but the furmers are usually onlie incorant of the cause.

Medical advice must be at hand. It is found necessary now-adays since cattle are dying from many contagons diseases. The farmer does not know the cause of these and when cattle die suddenly or in large numbers the people suspect posoning. But many cases will be found attacked by IUNDERFEST or some other contagions disease and no proper assistance is available. Hence the necessity of medical assistance is much felt. Formerly it is said that almost all villages had some expert bands who would detect the cause of death. But those who bad some expert hands who would detect the cause of death. But those who bad some special knowledge of any subject tried to hild it and kept it secret. That being the case, all knowledge of the matter has died with them. They used to treat almost all cases by using or applying the juice of some plants. At present also some such men are found

bero and there, but they are very few and hence veterinary assistance is necessary. When such assistance is available it will be easy to show the people the necessity of isolating the cattle affected by contagions diseases. For serious losses are recorded chiefly through want of knowledge. Many cattle are affected by foot and mouth diseases (common everywhere) and the affected by foot and mouth diseases to common needly of the serious diseases.

All this is not enough if the cattle do not receive somebody's personal attention. There must be somebody to give special attention to them. In its absence all is useless.

Famines are great destroyers of cattle. The remedy (suggested above) of keeping at least one year's fadder in reserve is the best remedy to avoid to some extent the wholesale losses from famine, but it involves, as will be seen, a certain amount of capital lying fille, as an insurance. The other drainage of the cattle is the slaughter bouse. We have no special breefs for heaf purposes as in other countries and bence the work cattle are used for slaughter. Hence some arrangement is ladly wanted to prevent good, healthy, asselul and young cattle being slaughtered. For this associations are seriously needed which would look to this question. And they must be assisted by the rich; for at times they may require money to buy cattle to avoid its falling into the hands of the agents of the interest.

Such are in my opinion the two chief things limiting and hiadering a proper increase in the number of cattle, when combined with the poverty, apathy and ignorance of the people in many of our tracts. I will conclude by a suggestion which demands larger capital and larger interest on the part of business men rather than of cultivators. This is that some companies may be formed in order to breed naimals for work. No doubt this is a costly and risky business. But in the end it will sarely succeed and will be a paying concern, if well mannged. In most other business there is a difficulty in disposing of the produce; in this there is none, for there is a large, keen, and increasing demand for well grown and useful minimals. It is necessary, however, that such companies should have their own lands for growing folder, and also as pasinge. The men in charge must have a liking for this business, must have a thorough knowledge of breeding. Then and then alone it will be a paying business. There are already a number of rich associations

already in existence which are formed for the preservation of cattle. It is possible that these might be induced to go in for the improvement and multiplication of stock as well as its preservation, and if so they would probably farnish an object lesson which purely business commises would not be slow to follow.

## The Shirhatti Cattle Fair.

M. L. Kulkarni.

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an the Southern Maratha Country there are a number of places where L cattle fairs are held annually. She hatte is one of the most important of these faces. It is a taluka town of the Sangli state and is situated to the south about twenty miles from Gadag or about tweatyone miles to the north-cast of Gudgeri railway station. I'rom both the railway stations there are macadamized roads. The fair is held in the month of May which is the most suitable time for cultivators to attend, the fast being free after the barvest of Rabe jours and other crops, and also after the picking of cotton. It is also a time when cultivators have plenty of money in their hands as a result of the disposal of their cotton crop. Thus a number of buyers of cattle go to the fair and a large number of cattle are sold in the course of three to fear days. The fair is held in memory of a languat swami who was a great saint. A big convent ( mg ) is built after his name in the middle of which there is a square palla built samadhi ( mareff ) of the swami which is the place where the visiting palgrims worship. The pilgrims consist of all classes of people rez. Lingayats, Brahmins, Marathas and Mahomedans. But the majority of people are Linguyats.

Cattle of various ages, from young calves of one year old to hig work-cattle of advanced age of various breeds are brought for sale in the fair, the majority of the eattle being, however, of the Mysore breed. The original breeders in the Mysore province brieg a number of young calves from one or two years old to the Mailar and Kurvatti, cattle fairs in the Rane-benuit talaks. These are bought by local cultivators and are carefully reared for one or two years more, and then sold in the

GENERAL VIEW OF THE SHIRMINTH CATHLE FAIR.

Shirahatti fair. Certain cultivators in the Ranebenunr and Haveri talakas make it a profession to bay young calves from Mysore at a cheap price, feed them for a year or two and then sell them at the exorbitant rates of Rs. 300 to 500 per pair. An excellent pair of ballocks is sometimes sold up to Rs. 700/-

A large number of cattle to the extent of about three thousand were brought in the present year to the fair for sale. About three quarters of the number were Annat Mahal cattle and the rest were local breels. A few 'Krishna valley' and 'Khilari' cattle from the Jath State were also brought for sale. There were only four Amrit Mahal cows in the whole of the fair. Mysore breeders never sell their cows or heifers. They sell only the young bull-calves. A good bull-call of about a year old is sold at from Rs. 100 to Rs. 125.

The anmher of cattle ( three theasand ) present for sale at Shirahatti is said to be only half of the number of last year. The fair thus scems te be a very large ene and it deserves some sort of encouragement from the Sungli state. The Sangli state does not at present levy my tax on the cattle brought for sale as is done at Chinchli nor does it take any trouble to keep any record of the number of cattle which come for sale, or the variations in prices year by year. It would be very useful information if all this were noted down, us well as the various places from which they are brought and the ages of cattle with their prices. This information although of little value now would be of great use after some time, in order to indicate how far cattle breeding or rearing of young calves is developing in the Shirahatti taluka or in its neighbourhood. However the Agricultural Association of Shirahatti which is patronised by the Sangli state intends to organise a systematic awarding of prizes for the best animals in the show whether they are bred in the Sangli state or outside and also intends to keep a record of the exact number of animals sold. The idea is excellent if properly organised and continued permanently.

Some people think that the prizes awarded at the Shirahatti and similar siews go to ont-ide people, that is to say to the Mysore breeders as the majority of good cattle come for sale in thee fairs from that state and consequently they expect contribution from the Mysore state. The idea seems to be quite narrow. As we are now-a-days depending more and more on Mysore cattle it is our duty to encourage tho breeding of these cattle whether the breeders belong to the Mysore state or are our own people.

## Experiments in Lac Inoculation.

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## T. R. Kotwat, B. A., LL. B., Sab-Judge, Poona District.

(The following account of experiments which were made by Mr. Kotwal aswad will be of very considerable interest under the present conditions when the cultivation of lac as a bye—industry is being extensively recommended.—Eda.)

JTHE difficulties with which I have had to contend in my experiments in lac inoculation are very considerable, as I have to
more every alternate month between Saswad and Talegaon and hence
I have not been able to watch my experiment continuously. Some of
the trees inoculated were not my own and were used without any previous priming. There were three heavy showers of min soon infer the
inoculation in October 1919 with stormy weather nod great lightning.
There was the severe cold weather in the call of January and beginning
of February nod much wind from that time to the end of May. The
experiment may be said to have been carried on under natural conditions and those too very nufavourable. The following trees were

In my own compound an \*Umber\* (Ficus glomerata\*) tree on two branches. One branch has small specks of lac about the size of a pet in several places scattered on parts of the branch. The other branch is fully covered with lac similar to the sample sent herewith from a \*Unbal\* (Acacus arabica) tree. (Vade illa-tration). The length covered is about 2; to 3 feet.

Many insects crawled up the branches of the Bholar (Cordia My.ca) tree but were washed away and tho-e left did not survive long. The branches were fine new juicy sproats.

The branches of Shitaphal (Anona Squamosa) trees were inconlated. The in-ects spread very rapidly and actited on several branches. The branches were then very leafy in October 1910. Now the old leaves have fallen off, new ones are coming out, the branches are hare and the lac can clearly be som. On three or four branches there are small in-



Lac grown on Babul twi ( natural & ze. ) 11 Mr. f. P. KOTWAL,

minerable specks of about the size of a small pea. On other branches the lac is thickly spread something like the sample sont. (Vide illustration). The trees used had minerous branches fit for inoculation and trees were not higher than six or seven feet. They seem to thirive well in parts of this taluka. From what we can now see, it would appear that with proper care and attention the trees may be fit for cultivating he equally with Bor (Zizyphus jujuba). Palas (Butia frondosa), and Kasumb (Schleichora trijuga). It is worth while making truls. These trees thrive in Bissein in the Thana District, and the Superintendent in charge of the gardens at that place may perhaps test and amplify in experience and show prictical results. The mesers on Kiratha (Pernna Elephantum) tree were all wished away. The mesers on Pangara (Eliphantum) were also washed near the brack of Bhokur, Pangara, and Karatha is smooth and differs from that of Stataphal, Umber, Bor, and Babul.

One Bor tree was unoculated and the masets have formed fair internstations around some branches. Boys disturbed the branches a great deal being attracted by the berries. This tree was not a failure.

Two Babul trees were intendited. The sample is sent from one tree. The other has fared fairly. These trees are in the compound. There was no distributed.

I did not see the trees from February till the end of May. I believe this experiment to be a success so far as a layman and a beginner with no previous training, theoretical or practical, except his own reading and experiments can modestly say.

Three Pimp Il (Ficus religiosa) trees were morniated. The benches of two showed good signs that the insects had spread and had began to form increstatious. They are still to be seen on the bunches. Probably the source cold affected these insects. Two trees were by the river side, and one in the heart of the town. Working under the most unfavourable circumstances I conclude that Babil, Umber, Shitaphal, and Bor trees inspire hopes and looking to the mitial cost and trouble the experiment may be continued under trained supervision.

I got the mother lac free of charge from Para in October 1910 at Davan time. The rates charged to the public are moderate. I got the sticks tied to the trees under my supervision through my peons and the trees have throughout remained open to inspection to all who desired it. My experiments at Talegaon were enough to inspire me with hope to repeat the same at Saswad. I have done these things more for recreation than for profit. My experiments were confined to two dozen sticks and it would be pre-umptions on my part to claim too much for them.

## Saving of rice seed in the Konkan,

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#### G. K. Kelkar.

Assistant Professor of Agriculture.

HE Konkan tract includes the districts of Kannus, Ratnagiri, 
Kolaka, and Thana and extends all along the sea-coast. It is 
bounded on the South is the South Kannur District of the Madras 
Presidency and on the North by the Parth talnka of the Surat District. 
This tract is mostly hille-coareed with forest growth-the rainfull being 
heavy, sinflictent and assured. Two kinds of rocks are found here-in the 
Southern Konkan laterite is the principal rock and the soil formed from 
it is poor but well drained. In the Northern Konkan the prevailing 
rock is tran and the soil found is of emeric anality.

On account of climatic conditions rice forms the most important crop of the Konkau-it being the staple fool grain of the people.

The following represents the average under rice in the 4 districts named above:—

Kanara	184,502
Ratuagira	71,852
Kolaba	251,507
Thann	318,107

825,968 acres.

As pointed out above the soil in the Southern Konkan is inferior in fertility and the out-turn of rice obtained per acre is low by comparison with that in the North Konkan. On account of this poor out-turn the rice eating/population of the South, principally depends on the North ern districts for at least a purt of the year. At least, I know this is

the case in Ratnagiri. When the North Konkin is unable to meet the demand Rangson rice (Halwa) comes in and makes up the deficiency. When this is the case, every effort should be made to find out some means by which the rice crop can be improved. There are many ways in which this can be brought about. One of these is the swing of seed, which is required in very large quantities in the case of the crop under discussion.

This article is intended to give an account of an attempt in this direction.

While I was on leave at Rittinger I beard that a gentleman Mr. Bullershire Wasud o Jode, Bullers, was trying some experiments in connection with the syring of seet. His village named Dhamanse (attent ) is situated about eight males from Ratingfit.

Mr. Joshi is very enterprising, industrions and painstaking. It will not be out of place if I mention in brief the practices of agriculture he is following. He has planted executints, freeze nuts, plantains, limes, figs, oranges, knol-khol, cribbyge, chillies, bringals, ginnen grass &c. in a small garden cound about his hon-e. He preserves his farm yand munure, as hes, and last scrapings from the byres in separate pits. Recently he has taken up to the preservation of name by putting earth under the feet of the cattle.

During the last three years he is working at the problem of finding out whether any saving of seed on the effected in sowing seed in the seedbad of rice and so far as the results, go, they appear to be very successful and encouraging. The details of his methods are given below.

Before the commencement of the experiments Mr. Joshi need to sow four manude and fourteen prints of pully on a seedbad of thirty-five and a half gnathus and the seedlings rused on such a bell were enough to transplant two acres and twenty-right gunthus of land. Now he sows only four and a half pulls of seed on a seedbel of only sixteen and a half gunthus and is able to obtain sufficient seedlings to plant the same area as by his old method. Most of the cereals tiller freely when they are given plenty of room. I have counted up to eighty tillers produced by planting one seed of wheat. Mr. Joshi's thin method of seedlings encourages free tillering and thus supplies him with plenty of seedlings.

Mr. Joshi's preparation of the seelbed consists in ploughing the area and making it very fine before spreading the rab. In his method there is no sating of rab internals. He spreads the same quantity of material which he used to spread on thirty-five and half gunthas, on the smaller area viz. 104 gunthas. When the material is sufficiently dry, he covers it by a layer of course grass and then spreads a uniform layer of small clobs of earth, not bigger in size than an ordinary arecannt, to a depth of about an inch. On account of thick layer of the rab material as well as of earth, the whole thing larms slowly as if smother bornt. He believes more in the addition of the ashes and heating of added layer of earth than the heating of the surface soil.

After burning the ashes are immediately ploughed in. The seed is seed per square foot and then mixed with the soil. The seedings are ready for transplantation within twenty-five to forty days from the date of germination. The early varieties take twenty-five days and the late varieties that the forty days. The seedlings begin to tiller within a fortinght and the tillers vary from two to eighteen per plant. The seedlings tiller freely and graw aground; on account of more air, manuro and large feeding area for the roots.

When the sectlings are transplanted into the mun area, the tillers are separated and planted three to four in each place. On a medium soil nine inches distance is allowed between two sectlings each way and one foot on a better soil. At the time of planting each planter is supplied with a measured stack for use at the time of transplanting. The sectlings tiller further in the main area and produce spikes which vary from twenty to thirty-six per banch. During the last two years Mr. Joshi followed the method only during the rains, but during the years 1910-11 be raised his secilings of Vargana nee (the hot weather crop) and transplanted precisely in the same way giving nine inches distance between bunches of secilines.

I had the benefit of seeing this crop in the mouth of February last while still standing. I found the whole area very systematically planted and the crop was uniformly growing. This system of planting at regular distances is a little more expensive than the ordinary one in vogue, but it seems to pay in the end.

It would be seen from the results arrived at by Mr. Joshi, at Dhamanse, that though there is no saving of rab materials in any way,

the whole quantity being utilised on about half the area, still much less land will be required to be attended to for the seed bed and there will be an enormous amount of saving in seed.

He saves four mann Is an I nine and a half priles of see 1 in caltivating an area of two acres and twenty eight gunthas and this seed alone is sufficient for one man's feed for four months. This means a great saving when the whole area under rice is taken into consideration.

The area under rice reported above is \$25,938 ucres. If we deduct half of this (412,084 acres) as light 1 and where conditions for impounding water are unfivourable and the broad-casting methol must be followed, it leaves 412, 934 acres, where the transplanting method is necessarily followed. A very large amount of seed saving can be effected from the above are i.

Taking four manuals and nine and a half priles as the amount of seed swed for every two acres and twenty-eight guntless as a basis, the amount of seel that can be saved in the Konkan tract alone amounts to 35130 Khandes. This is obviously an extraordinary saviac.

Although the method of planting few seedlings in a bunch is of recont introduction in our Konkun tract, still we find the Bengul and Madras Agricultural Departments are experimenting with single seedlings for the last five or six years. It has been proved on the Samalkot Government Farm ( Madras ) that by planting a few seedlings only six pounds of seed is enough per acre instead of seventy pounds as ordinarily used by the cultivators. The instructive results obtained at the Cuttack ( Bengal ) agricultural station and reported during the year 1908-09 are given below :-

Treatment.		Outturn per sero in maunds (80 lbs.)								
	1005. 1906.		6.	1907.		1908.				
	Grain s	traw.	Grain	straw.	Grain	straw.	Grain	straw.		
	mds.	mds,	mds.	mdı.	mds.	mde.	mds.	mds.		
1 Seedlings per	hole, 257	36	19	221	265	50	341	601		
2 Seedlings do.	237	345	18	231	26	55	371	613		

231 233 657 36 673

> 251 721 367 60

161 26

4 do.

8 do.

do. 221 311

оħ 22 367 The results of four years show that one seedling per hole gives an outtorn equal to two, four or eight seedlings per hole; honco there is no need to transplant more than one seedling per hole.

Mr. John has one great advantage in having an ample supply of stream water at his command. He can let in water in the field when required and stop when not needed. But such situations are numerous in the Konkina. Only experimenters and workers are needed. Mr. Joshi's experience is only of two or three years' standing and his results may be taken with a cert in degree of emisor, still there can be nodeable that the method adopted by him, if generally successful, will greatly contribute towards sowing of pittly seel. If the leading landlords, who cultivate their lands themselves, take up this problem and work it up seriously, it will be of immense benefit to the cultivators of the Konkin.

### Wire-Netting as a Protection Against Crabs in Rice Seedbeds.

BZ.

#### K. V. Joshi, B. Ag.

IN the Konkan and the Maxal tracts of the Decean where rice is the chief crop, the land crab is known to everyone, on account of the damage it does to the rice seedlings.

Losses from crals are fur greater in the Maval tracts than in the Konkan. The reason for this is not known but it may be due to the colder climate of the latter truet. The dramage is done to the scelled and not to transplanted rice, the reason of which is explained further along in this note. Crabs also damage the bounds of the rice fields by boring boles in them, and the cultivator is often thereby put to trouble and has to incur considerable expenses in repairing them, so that they will hold water standing in his fields.

The crab which does the damage referred to is a small animal generally of the size of a small rat with a hard shell covering almost all parts of its body. It has several pairs of logs, but the most characteristic feature of the animal is the presence of the large pincers which give the crab its peculiar appearance. It wilks sideways instead of

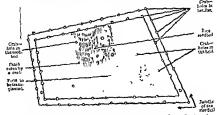
straight. These crabs always live in underground burrows which they dig themselves. These may be either straight down, zig-zag, or curved with two openings. The burrows are generally excavated on the bundhs of rice-fields or the bunks of streams and unlass.

The fool of the crabs is green and dry grass, and also, any organic matter to be found in the soil. It is a timid animal and rans away and hides itself at the approach of a man. The pincers above referred to are its only organs of defence.

There are three knuls of crabs. 1 Mathyr or Pandhra, 2 Khelad and 3 Chingh. The first two only are murrons to the rice fields while the third have in villages and jungles. It is always black in colour.

Crabs are eaten by the cultivators of the Maval tracts and the Ronkin and are said to be very nourishing. The third kind numely the Chingli is the species which is preferred for fool. After the transplanting of rice is over the cultivators have very little field-work and so they often go out to eatch crabs; sometimes they go at night with torches in their hands, to the banks of rivers and streams where they find orabs in large numbers.

The tail or posterior end of a crab is bent under its lower surface and tightly held against the boly. This forms a cavity in which in case of the female the eggs are laid. After hatching the young remain in this cavity till the first rains in June when they issue forth to forage for themselves. Each mother crab sends forth from one hundred to one hundred and fifty young about the size of a large spider. From this time onwards throughout the rainviscison the crab lives more above the ground than in his burrows, spending his time in search of fool. The rice is sown at the first rain and grows much within a few days. The wild grass does not start as early as the rice seedlings, which are therefore the only grass food that the crabs see on coming out of their holes. So they attack the rice seedlings and do a great damage by eating them. They feed mo-thy at night. At this season some of the crabs leave the bandhs and make their holes in the seedbed proper, so that they get food near by on coming out of their holes. They cut the seedling at its base and take away the whole seedling. A view of the seedbed about three to four weeks after sowing will show patches of different sizes eaten by the crab. The following diagram may give some idea of the condition of a field in the Mayal tract at this stage.



The crab does not do much damage to the transplanted rice because at that time it gets young green elsewhere, and the stems of rice are not in the soft and succulent stage which it prefers.

By the end of the monsoon the crabs close their holes by bringing earth from below. I have observed that the earth which they bring up from below is always wet which shows that as the moisture goes lower and lower they deepen their holes further and further thus always keeping themselves in a moist place. The depth of a crab-hole varies from one to four feet or turns.

The remedy practiced by the cultivator is to pour a solution of cowding m water into the hole of the crab. After three to four minates the crab energes from his hole probably on account of the strong and navty smell of the cowding. He is caught and killed. Some add to this solution larany leaves cut into small pieces which makes the smell still worse. The write and cholivare of the cultivators spend considerable time in killing crabe by this method, while the cultivator himself is engaged in plonghing his fields. Crab-killing by this method goes on for about a mouth.

But this is not a certain remedy against the erab. The erab may come out provided it is in the hole into which the condung solution is poured, but often no erah appears. In cases where the holes are very deep the quantity of the solution required is very large. Moreover there are thousands of holes in one field especially on the bandles from which they walk to the sectlings by night and hide themselves by day. Hence the number of crabs to be wateled and kulled is sourmon, and

so under these circumstances the entitivator has to sow a much larger seedbol than would otherwise be necessary, knowing that a part of it will be eaten up by the crabs. This means that more rab material to burn in preparing the scalled will be required.

The unisance from the crab has been a great hindrance in the experimental work of which I have been in charge, in connection with investigations into the value of red and its substitutes at Lonavla. Ammonia liquor was need in-tend of cowlung solution during one reason but the same difficulties as with cowlung were experienced. Moreover in using the ammonia liquor it is necessary to walk in the seedled which at times duringes the young seedling. Further, as the experiments were in a measure concerned with the value of manners, it was not were as a rule to add in powerful manural agent like ammonia.

So in the year 1909, it was suggested that a fencing of wire-netting should be put round the experimental plots, the object being to prevent the crabs outside the fencing from going in mod thus leave only a limited number who are to be destroyed mode. This object was largely fulfilled as the bigger crabs could not go through the fencing since the holes of the netting were smaller than their bolies, nor could they climb up. But those smaller than the holes of the netting could easily go through.

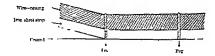
Therefore, in the following year, a further step was taken against them and a strip of thin 1700 sheet was fixed round the fencing allowing a little of it to be buried under ground. The breadth of this from sheet-strip was six inches. Thus the egrees or ingress of the small crabs was presented. There only remained the killing of the crabs which were intendly within the Landles of the plots proper. A regular campaign was made against them last year, after the rice was transplanted, by means of the cowding solution system, and a large number-small and big as many as fixe thousand-were killed. Of coarse the number still left inside was also large and could not be calculated. The young ones lad already latched out and they were not killed to any great extent.

As a re-ult of the treatment, however, the damage was reduced to half what it was in the previous year, and if the campaign be contained for three to four years, the protected area, I think, will be free from earls. In our experimental plots there are four bandls to each plot and so the number of bandls insule the protected area is large which enables the crabt to hide themselves and excape capture. But if in a big field a fencing of wire-netting is made with no bandls insule, the area could be freed from the crabs much more quickly.

The method of putting in the wire-netting is as follows :-

First a sloping ditch mine inches deep and one foot broad is made round the seedbed area which is to be fenced with a wire-netting. The wooden pegs about two feet long ( about as large as tent regs ) are fixed at every fourth foot all round, putting about a foot in the soil and leaving a foot above. Then wire-netting which is generally three feet broad is cut into two pieces of each of a width of eighteen inches, and is put on the slope of the the dirch six or seven inches deep, the slope always being towards the ontsile. It is then covered over with earth. The remaining one foot of the wire-netting is fixed to the pegs all round by means of staples, three to a per. A than iron sheet strip six inches broad is now fixed out-tile this fencing, putting an inch or two inside the earth and leaving four to five inches above. This is also fixed to the pegs by nails. These strips can be cut out of galvanised fron sheets, of the usual size ( eight feet by three feet ) in which dimen-ions they are sold in the bazars. The following figures will give some idea of the fencing.

#### I VIEW ADOVE GROUND.



## II VIEW PELOW GEGUAD.



The cost of putting this kind of wire-netting fencing to a rice seedbed sufficient for true-planting one acre may be calculated as follows:—

The area of welled should be approximately six gunthas i. e. it will occupy an area one hundred and twenty feet by fifty-four feet so,

that the length of the wire-netting and as well of the iron-sheet strip required is 350 ft. each.\*

Cost of 350 ft. of wire-netting 1½ feet b Rs. 18-0-0 per bundle of 350 ft. by th		R	S, D	p.
( to be ent in the middle )		0	0	0
Cost of 350 ft. of iron sheet strip 6 inches at Rs. 3-0)-0 per sheet of eight feet b				
feet i. e. 7. 3 sheets at Rs. 3	•••	21	14	5
Cost of 8S page at two annus per dozen	•••	0	14	8
Cost of staples and nails	•••	0	15	0
Wages for curpenter and one man for two	days nt			
0-8-0 and 0-4-0 respectively	• •••	1	8	0
T	otal Rs.	3	1-1-	-1

Thus the cost of feueing a seedbed sufficient for an acro comes to Rs. 34-4-1 which should last ten years or more. Taking ten years as its average duration, the proportioante expenditure for one year comes to Rs. 3-0-10. Now in the present practice the cultivator is required to sow a bigger area for the erabs. The loss in seedlings due to erabs may be calculated from ten to fifteen per cent. of the seedbed, depending on the locality.

The cost of raising seedlings sufficient for one nero by harning branches for rub (six gauthus seedbed) comes to Rs. 14-4-9. (Cost of cultivation Rs. 2-2-9 per guntha, cost of seed four annas per guntha).

Sapposing that 15% is the damage to the seedlings, its cest comes to Rs. 2-2-3. Thus in parting the fencing he is required to spend one rapee four annas more. Besides he will have to invest the sum at one time. The advantage of the fencing will be that be will not have to keep his wife and children in the field in the rains after the crabs except for the first two or three years. Thus their labour will be saved for the rest of the seven years.

Each year the material for rab becomes increasingly difficult to obtain and so the cost of the rab process increasing. The cost of this fencing of wire-netting will soon come to be of financial advantage, but

The length of the wire-netting could be considerably reduced if the seed-bed were made more square than this. The same area would be iccluded if a square bed, eighty one feet on each ade were used, and then only 324 feet of wire-netting would be needed. ( Lds.)

it does not seem to me advisable to introduce it generally in the present conditions.

It may be noted here also that nine crabs' holes bored obliquely in a curved manner with two openings were found male by the crabs from ontside to in-jie below the wure-netting, in a length of two thonsand one hundred feet of feneng. This the crab is likely to do in course of time but it can be checked by a comparatively small amount of observation over these boles.

In the present year an area sixty feet by ninety feet was fenced with wire-netting for the seedhed for growing various varieties of rice under experiment and as there was no bundle inside the fencing there was very little damage done to the varieties—in fact none. It is observed that if a bandh between two fields is removed and the two fields are made into one, the crab leave the locality and shelter in the vide bandhs of the same field. So if there he no bandhs inside the fencing there will be no good shelter for the crabs and so they can be got rid of in two years.

# How to Study Botany. BY W. Burns, B. Sc. (Edin).

IN ancient fables we read of enchanters who by a wave of their wand could mise tempests, level hills, and strike men damb; but more marvellous than these old tales, and astoundingly real, is the transformation effected on the face of India year by year at the coming of the mins. Here in the Deccan during April and May the barren hillsides lie scorched and yellow. The roads are intolerably hot and dusty, and the days long and weary. Thanderstorms and occasional downpours herald the Rins. At last they come, rolling up the valleys in irresistible cloud battalions, bursting in streaming torrents and drafting showers. A few days of this and lo1 what a changes and drafting showers. A few days of this and lo1 what a change. A great wave of greenness seems to have swept over the land. No longer is the hillide belack or the desert larren. The delucate verdure of new grass and springing both has hadden the waste places. Life comes with a rush. You shall see the wild plantain on the Ghats opening leaf after leaf as the water soaks to its parched roots and

reawakens the sleeping life. Even stones become green with algae, and the wave of vegetation threatens to enter our very houses.

It is indeed a time to raise songs in a post and prayers in a devotee. To the student of science it is an irrestible call to seek after Nature's secrets and pry into the springs of life.

Many students have felt this call, lived for it, died for it, and left us as their legacy the vast and varied science of Botany. How shall we follow in their footsteps, enter into the mysteries of life, and add something to that fair science?

We are students. Some first year, some second, some third, some (let us say) us year, but all students and we loope to be students till the end. What have we in common in the study of this science and what methods are specially suited to each stage of our advancement? Let us think over these matters a little.

It seems to me we have in common the need to have our eyes opened first to the wonder of the hang world around us and seemed to our own powers of understanding and controlling that world. Plants we have seen since we were born. They have become common to us and we need to be shown that nothing fixing is common. Then we need to be shown that nothing fixing is common. Then we need to be shown that in us are the intellect and the energy to seek out the secrets of the life of these plants and to turn our knowledge to the benefit of the race. As students of an Agricultural College we must never forget this latter point. Our knowledge is for the improving of marks material conditions.

Again, we all need guidance in our studies and a amply of botanical wisdom from those who leave worked before as. Here come in the parts played by trachers and books. Good tracher sand good reference books prevent the student from wasting time in fruitless below and fattle experiment, but they do not and connect take the place of the student's own questioning of nature. The tracher helps the student being his studies, nesists him over some difficulties and shows him likely points of attack, but the student who relies on his teacher for his actual knowledge is no student who relies on his teacher for his his knowledge for himself. Now, how is this to be done? Obviously by direct observation of and experiment on plants. In a curriculum similar he ours it is apparent that this cannot be carried to the fullest extent, and recourse must be had to books to verify and amplify facts extent, and recourse must be had to books to verify and amplify facts personally gained. Books may be of real use to the basy student if critically read and analysed so that the information thus won is folged

systematically in his brain ulong with and completing the knowledge gained at first hand.

Now as regards the various stages of our progress. The business of a first year student is to attempt to see as much as he can of plant lie and understand as much as he can of the way plants grow, feed, reproduce, and of how their bodies are constructed and adapted. Accorate knowledge of as many plants as possible is the aim. When asked, for example, to tell what be known concerning the function and structure of leaves his mind should immediately go brick to this and that plant that he has seen, he shandl conjure up the place where he saw these plants and the questions he asked himself about their leaves. To this he should odd the well-digested facts got from experiments shown him or made by himself, and should complete his idea by well-weighed statements from reliable nuthors. His knowledge is thus compact and complete so far as it goes. In applying his knowledge he should endeavour to see how the operations of practical farming arise out of and are connected with plant physiology.

The second year man in this College should continue on the lines just down, but should give more nttention to the comparison of plant structures especially of flowers, and should endeavour always to see how a plant is related to its surroundings. There is large scope here for the man who is keen to know now plants and these can always be named for him in the Herbarnsm of the College. He should devote special attention to accurate dissection of plants of agricultural importance and should not rest content until he knows his few material orders thoroughly-not only as regards their distinguishing characters but also as regards their distinguishing characters but also as regards their distribution, pollication, mechanisms, relative systematic position and so on.

The third year man should devote himself to n close study of the few cryptogamic types in the syllabus with a view to finding and grasping the unity of structure and function which shows us that all plants are derived from one source. The study of plant discases needs careful microscopic laboratory work and a quick eye in the field. Especially the conditions favouring or disfavoring diseases should be noted. Plant Breeding is a difficult subject but if the facts of variation are represented to the mind by known and actually seen cases then the basis is sure. The main thing is to get practical examples of all the phenomena of variation, crossing, correlation &c., otherwise knowledge is indefinite and useless.

In this College it is not possible in the three years to go very deep into the study of Botany, but a third year man englit to be so trained and disciplined (mainly by himself) as an observer, an experimentalist, a reader and a logical thinker that he will be able and eager to push on to new postuctive work in this or any other science.

## Some Agricultural Proverbs of Gujarat

БY

B. S. Patel.

Fig. 111: study of the common current proverbs of a district or a people is a very fiscinating one. In the present article, I am going to try and describe some of these most common in Gujurat, and as the Magazino is of a technical character I propose to limit myself to these which are in most frequent nos in connection with agriculture. A great deal of traditional wisdom is contained in many of them, and hence, it is possible that they may farms in an insight into the actual experiences of the Gujarat farmers, who are, as is well-known, considered probably as capable, as industrious, and as successful as my in India. In the explanation and translation which I can give, it is inevitable that some of their charm and force will be lost, but, in spite of this, some idea of their unantic will be retained.

In the first place, let us consider the names and dates of the Nakohatras, or divisions of the scason on which the conduct of most agricultural operations is based.

The lunar year is divided into twenty-seven nakshatras, which form the laces of religious, commercial and agricultural operations. Each nakshatra contains threteen to fifteen days. The nakshatra being a much shorter period than a month admits of closer attention and a closer relationship to agricultural operations.

The names of the makshatras and the dates for Surrat 1967,

6th November to 18th November 1910. — Vishakha.
19th November to 1st December 1910. — Anundia.

2ml December to 14th December 1910. - Jyestha.

15th December to 27th December 1910. — Mal.

28th December to 9th January 1911. — Purceshadha.

10th January to 22nd January 1911. — Uttarastadha.

- Shravan. 23rd January to 4th February 1911. 5th February to 17th February 1911. - Dhanishtha. 18th February to 2nd March 1911. Shatatara. 3rd March to 16th March 1911. Purwabhadrapada. - Uttarabhadrapada. 17th March to 29th March 1911. 30th March to 12th April 1911. - Renti. 13th April to 26th April 1911. - Ashwani. - Bharani. 27th April to 9th May 1911. 10th May to 23rd May 1911. — Kritika. 24th May to 6th June 1911. - Rohini. 7th June to 20th June 1911. - Mrigshara. 21st June to 4th July 1911. - Ardra. - Punarwasu. 5th July to 18th July 1911. - Pushya. 19th July to 1st August 1911. 2nd August to 15th August 1911. - Ashalesha. - Magha. 16th August to 20th August 1911. - Purwa phalguni. 30th August to 12th September 1911. 13th September to 26th September 1911 .- Uttara phalauni. - Hasta. 27th September to 9th October 1911. - Chitra. 10th October to 22nd October 1911.

23rd October to 5th November 1911. — Swanti.

On this basis I will give a number of proverbs in common use.

#### 1. Proverbs Relating to Rain.

If there is no rain in Rohm there can be no sufficient folder for bullocks.

If there is lightning in Robini and no rain there will be very little harvest.

If there is intense heat in Robini and high winds in Mrigashar there will be heavy sain in Ardra.

Magha knows no medium either no rain or rain in heavy showers.

If there he rain or lightning on the fifth of the first half of the month of Ashadha, he sure of good monsoon and keep only bullocks and seed.

Rain in Ashwans foretells a scarcity of cores, rain in Recti foretells a very poor monsoon and rum in Bharani foretells absence of grass even if it does not rain in Kritiska.

A sheaf of Pushya sowing will produce as much as an armful of Ashalesha, a head load of Magha and the entire field of Purvoa sowing, fit only for folder.

If it rains in Ardra the whole year will be prosperous.

59

The rains of Magha will produce about mee,

If it does not rain in the month of Stravana so much corn will be produced as to enable the farmer to fill his granary.

Rain in Pushya is very beneficial to the crops.

If it rains in Hasta all sorts of grains will be produced.

If it rains in Uttara phalguni so much grain will be produced that the dogs oven will refuse to eat of it.

It is better to have heavy rains or no rain in Robini than to have a little rain.

Rain in Ashalesha is so injurious to the crop as to be of no value.

If it rains Purwa the farmers will be filled with grief.

Rain in Swanth is so injurious to cotton as to leave the cotton cleaner's bow quito ideal.

The rain in Chitra is so heavy us to flood the rivers and so strong as to throw down even standing walls.

It is generally showery in the month of Strawana, it rains heavily in the month of Bhadrapada while very little min falls in the month of Aso.

#### 2. Miscellancous.

Culture, manure and water are the things required to produce a full crop.

The farmer will gain in proportion to his care in cultivation.

Plonghing is absolutely necessary for the field to yield a full crop. If a farmer is tired of his work he will get nothing from his field.

Protection of the field crop depands upon the maintenance of the hedge.

As we sow so we reap.

Thundering clouds give little rain.

No amount of artificial water can compete with rain-water.

Rain at an unsuitable time is of no use.

If a man wants to carry on agriculture, he must have a cart and a pair of bullocks.

Plantain bears fruits once in life and a maugo-tree does it often.

Whether a field is workable or not can be judged only on the field.

Sow the crop according to condition of the field.

If a farmer does not attend the field operations himself, he will be the loser.

Usar lands give no corn.

Agriculture and the drama require many men for their prosperity.

Loss made by missing opportunities in agricultural operations can never be repaired.

A cow is more priving to a farmer than a horse.

Jowar is often attacked by insects but never gurar.

The quality of fruit depends upon the quality of seed sown.

One should buy a milch buffale after milking, and a bullock after yoking him to a cart-

A germ of the smut di-case even in hundred manuals of Jouan seeds will sput the crop.

Many are dependent upon a farmer for their levelshood but he on none.

## Our Konkan Staple Crop.

#### M. N. Padwekar, B. Ag.

No the whole of the Bombay Presidency, there are four main staple crops res., Bice, Wheat, Bayri and Jowari, commonly need by all the people in varying proportions. In the Kookma II these almost entirely disappear and the sole grain crop would be rice, were it not for the fact that certain inferior milletess Ragdi, or Nacham, Varvai, Sauz, are grown on the poorer lands and eaten by the poorer classes.

As rice is the chief,—almost the only,—grain crop, the people of the Konkan almost entirely depend on it. It is generally considered that rice enters, as a class are energetic and persevering, if not very strong,—and this is certainly well illustrated in the character of the people of the Konkan. As already stated the people almost entirely depend on it. Almost all the preparations of entables begin from rice, and are too comerons to mention here. A short note on such a crop colled largely from my own observations, may be, it is hoped, of some use.

It is hardly necessary to mention that rice is essentially a crop of well regions, growing an tracts where the rainfall average is above fifty neches per annum or in places where the soil is marshy or capable of adding a good deal of moisture. It grows on soils of almost any desription provided it gets a good supply of rain or irrigation. In the Konkan rice is grown, in greater proportion, on lew lying soils which in some cases produce twe crops—kharjf and rah rice. There are some varieties of rice which grow even on salt lands. In fact rice can be grown on any soil, even on soils with the depth of few inches. The only soils which are not used for rice cultivation are those on the hilly and sleping land which are used for producing the inferior millets such say Nagla. Varia etc. The inferior millets form the food of the poor for a few menths, after which period they pack off to Bourlay and get employment in the Bombay mills. The men are usually careful to return home by the end of the hot season to work on their land, and grow another crop.

In the Konkan, the main or rather almost the only method of rice cultivation is that of transplanting at any rice so far as the tharf ergs concerned. Except in sait or in marshy lands thanf crops are grown by transplantation. In the case of rate prodly the method varies.

In the case of the Abarif eron what is generally done is to select a high lying plet in prepertien to the extent of the field available as a seedbed. Generally the seedlings in a plot measuring about four or five gunthas" are more than sufficient to transplant one acre. The selected plot then receives a layer of cowding wet or dry but generally dry in the Ratnagiri district, about one inch thick. It is however n prevailing custom in the Thana district to use wet cowdung, dry or decaying cowdung being costly and rare. This cowdung layer is spread in December or April according to the nature of the seil. Early preducing seils knewn in vernacular as Halvi soils get the laver in December. It then receives mother layer of bundles of shrubs or leppings of trees above it, the thickness of the laver varying from half an inch to one inch. The handles or loppings are technically knewn as " kawal." The cutting operation begins in December or thereabouts and ends with January as later on the leaves etc., are lost. Loppings of Ain, Kinjal, Nana, Bondy and Saya and such other ferest trees are selected. If these leppings be not available, some of the shrubs such ns Dhawati, Uhshi etc., are ent and used as well. Mahan and Garwi seils are green with a standing crop in January and hence the operations we have commenced to describe are in these cases postpened till the crep is harvested in March, and the soils are then treated in April or May till which period the Lawal is dried and preserved for such seils. The Lawal se reserved is naturally inferior as much of the contents are lest owing to heat and dryness. A few days after this layer of kawal is spread, it receives an additional layer of grass or Lawal. The grass

<sup>#</sup> A guntha is equal to one-fortieth of an acre.

spread on the roofs of houses instead of tiles in the monsoons and removed in the middle of winter to guard the houses from being set on fire, is generally employed. All these layers are about nine inches thick in all. Now only one thing remains and it is to sprinkle decayed earth or dirt from the vicinity of the house. If this he not sufficient, soil from some other place is obtained powdere land then lept acide for being sprinkled over the livers. The object of using this soil is two fold. The first and main object is to regulate the burning of the layers and the secondary one is to add bulk to the mass spread on the soil. The soil so re-erved is thrown over the layers by means of a sup-an implement used in winnewing. This operation is performed when the layer is wet owing to dew or in the alseence of dew, some water or water mixed with cowding if possible is sprinkled over the he ip before throwing the soil so that the soil becomes wet and gets a first etting. The whole mass spread in the field is then set on fire about the middle of the day. The natural advantage of setting tire to the layer at that time, is that the layer is heated owing to the bright sun and hence the fire easily and evenly spreads on all sides of its own accord. If the burning be too active and rapid some more earth is thrown which checks the fire and prevents the surrounding objects from any chance of being burnt. The intensity of the fire is due to the lawel and grass which burn out till the evening but the fire 1 not cutirely extinct for some time after. If a portion of the large still remains unburnt, it is again set on fire and completely barnt to aches. The plot to be treated is never ploughed before this treatment. The process of burning the soil just described is called . rab.

After a few showers of min, when the soil is completely wet, the whole field except the rabbed plot is twice ploughed and levelled. The first ploughing is technically known as Uthat and the second is known as Ber. After each ploughing the field is levelled. The method of ploughing is to begin at one corner of the field and tunning at the other corner at right angles to proceed half way and there turning again at right angles to complete the parallelogram. The figure formed is a rectangle in which one safe of the field forms one safe of the rectangle half the other safe forming the other sade of the rectangle. The plough then goes on forming similar as well as equal rectangles close by the first figure until the whole field is completely ploughed. Another method is to plough the field forming so unany ovals. The second ploughing begins crosswise so that the plot is completely ploughed.

Even before ploughing the field, they have to broadcast the seed on the rabbed piece of ground a few days before the regular showers begin, this sowing being called Dhulwaf sowing. For sowing purposes, the cultivators invariably select pure, unmixed varieties. Such of the formers as are well-to-do and as can afford, select a particular plot of the ground to get the seed pully from, when the crop flowers or when the seed is formed. The selection is simply the result of appearance. On this sale latrines are rarely hand and hence the fields are well manured in particular places. The crop here gives a fine appearance and such spots are usually chosen to take seed. The selection can safely he said to be practical and hence trustworthy. The selected plot is harvested with care when it is nearly ripe but not fully ripe. At this stage the seed is bright and plump and has a good appearance. At this stage the seed paddy is known as Kanlada a Bhat. It is then dried and the seed is separated from the bead which is called Lombi or Kesar. The seed is then carefully stored up in a Madi covering of new straw neatly wound keeping the seed paolity in the centre. The seed is so preserved till the next year's sowing season with special care. The farmers will even perish with hunger rather than think of using the seed rice of so much importance to them. The seed rice is not sold by anction even in case of distraint by Government, it being considered as one of the necessary articles for a family. In the case of negligent farmers they buy the seed from some that or lawllord who is executed to heard up rice of any variety. These only take into consideration as a rule, two main divisions coarser and finer varieties. This stored rice of any variety becomes the seed rice and naturally none can expect a good crop when the seed is not pure and good. But calamaties of this nature ile not often occur as the relatives help a man by lending him a portion of the seed rice preserved by them. Here it must be mentioned that the cultivator will never take his seed rice from a number of persons except in cases when he desires to cultivate so many varieties. The seed is lent to him at double the ordinary prace. Sometimes it so occurs that the cultivator has nothing to live on and cannot get any money from the sawlar, there being nothing but seed rice that he can mortgage. Umler such extreme circumstances, the cultivator approaches the later or sawkar with the stored seed rice and requests a bean of him on this security. entraiting him at the same time to take care of the stored seed and to lend the same to him at the time of sowing. The seed rice, in this case, is not sold but mortgaged. The debt prud is in kind and the rate of interest is 50 per cent. To illustrate the point—if a sawkar lends one mund to a farmer in Jane or daly of 1908, he will get one maund and a half in November or December of the same year 1908. No one will pay or lead rice to a farmer who has nothing to mortgage or who has not got his plot ploughed and sown. The amount and interest are paid in kind.

The seed obtained in this way is then broadcasted on the plot already treated with the ras process and the plot is ploughed hout two unches deep with difficulty owing to the hardness of the soil. The seed is sown some eight days before the regular showers are expected. The seed germinates a day or two officer a good rainfall. The seed required to obtain seedlings sufficient to transplant one nere varies from twenty-four to surty-four pounds, on no average, about forty pounds.

With salt lands which are called Lhari zamin, the method differs. The soil cracks in winter and summer but in the rainy season it turns as soft as butter with mad which is more than three feet deen. A few typical varieties are grown in such a soil. The labour required in such a soil is not great. What preparation of the land they have to do is to turn over the clods in winter and summer with a peculiar implement about six feet long and resembling an English row. The implement is known as Pendsh in Marathi. Transplanting cannot be resorted to in such soils owing to the mud produced as there is some fear of being barred in it. The seed is broadcasted after it is artificially germinated when the regular season commences. The seed rice is poured in hig circular metal vessels about four feet high with a diameter of about two to three feet. The vessel may be filled with water or water may be added afterwards. At any rate the seed paddy is well saturated with cold water till it germinates a. e., for nearly two or three days. The germinate 1 seed paddy is then taken out and carried over to the field where it is simply broadcasted.

( To be continued ).

### A method of treating the injury caused by the Spines of Hairy Caterpillars as practised in Assam.

BY

### F. H. Ahmed.

#### ....

THE spines or hairs of several of the hairy exterpillars are more or less poisonens. When they are stack into the skin they cause irritation and inflammation of the parts affected, whose cure is not quite cary. When proper care and immediate steps are not taken to get rid of the hairs, the pun becomes more aente and the parts become a mass of continued inflammation. I had recently the occasion of witnessing three cases what were affected almost at the same time of the day. One of these was not treated at all, to the second, letter of Potassian Permanganato was applied and the third was treated by the indigiaous method.

The country method of treating such in case is as follows:—Place sowen leaves of . Illecasia indica one upon the other over the affected part, then over these a piece of stone smidiently hig and hot to cover and heat the part; hold the stone for some ministe till the heat is felt on the parts. This is enough to harn the bars as is believed and it is found that from this time the inflammation, irritation, and pain hegin to case and in a day or two the part is cared.

In above cases the third method was found the most effective and took the least time to cure the injury, the second was not more saccessful than the first in which the injury was left without treatment. Afterwards the first and second cases were treated according to the country method but then took more time to cure.

It may be interesting to note that if a bairy caterpillar is placed in a leaf of Alocasia indica and the whole thing shaken together with slight jerks the bairs or spines of the caterpillar fall off and it seems as if it has moulted. The truth of this observation is quite easy to verify and can be done without any risk.

### College News and Notes.

Our magazine starts with the present number a new year of its existence—a year in which we trust it will continue to increase in influence. Its care and management also, pass this year to new hands, the senior editor and manager having concluded their college career and his dulen to their alma mater. In taking upon as the burden of this important trust,—a trust whereby we hope to bund faster the fluk that separate the past and present members of the College—it behoves as to take a retrospective glance at the career of our Magazine.

There is every reason for us to congratulate ourselves on the excellent reputation which the Magazine has obtained under the control of the late committee, which has put a great deal of honest and steady work into it. It has become a storehouse of much agricultural information of both great and small importance and a source of interest and study to the students as well as the general public. The wide circulation our Magazine commands in the Bombay Presidency is a convincing proof of this. We cannot but refer here in particular to the strennous exertions of some of the members of the late committee whose active help and zeal, though it was a valuable usset to the College, we are deprived of this Year. Messes. II. K. blehta, F. H. Ahmed, and S. R. Paranipe were among the first and the hardest workers for the magazine. They tended it in its infiney and with fostering care helped it to wax strong. We regret these gentlemen have left us but we congratulate them all, Mr. Mehta for the bright prospect, that have opened out to him in Bombsy, and Messes. Ahmed and Paranjpe for the successful close to their college career. We wish them all fortune's choicest blessings for the future, and have every confidence that they will not forget the ties that bind them to the Agricultural College, and that they will help by their contributions the upkeap of our magazine, as they laboured in its cause when members of the College.

The results of the University examinations though not equal to those of the previous year were still very creditable. It is unfortunate that there were a number of fadures in the F. Ag. examination. But the average standard of success was maintained in the S. Ag. and B. Ag. examinations. Twenty students have launched forth as graduates, twenty six have scaled the step to the B. Ag. class and fourteen to the S. Ag. class. We offer our test we have to Mr. laundar who stool first.



Mr F. H. Ahmed. Mr S.R. Paranjpe.
The Unit Editor and Manager of the
Poons Agricultural College Magazine.

in the F. Ag. class and has been awarded the Gulabdas Bhaidas Scholarship. Mr. Bhadkamkar of the B. Ag. class succeeds to the monitorship of the college hostel.

Of the special students, the first year men deported themselves well in the College examinations and so also those in the third year, all of whom have received the diploma in agriculture.

There is a large inflax of stribunts for the argicultural course, this year. Among the new first year's class, which now numbers thirty eight, we have more Christians and Parsees than in the previous years, the short course class has fafteen men on its list—an advance on the multiple of the last year, which shows the growing popularity of the class and the eigeniess of young new for election in agriculture.

We wish most hearthy all the students a prosperous year and trust that we shall have the pleasure of recording building successes at the end of the coming year.

We regret that, though the students of the S. Ag. and B. Ag. classes have taken up their furn-work with a will and are navious to turn their plots to the hest account, dime acture has not been pleased to smile graviously on them. The continuous run at the Legianing of June give signs of a good mon-oon, and the sowing operations were commenced as soon as there was a break. Unluckly however, the break has lasted already too long and is cuising grave anxiety. The S. Ag. men are all working numbernely at cotton, and the poor germinian of their crop shows the necessity of rain soon. We rely on Providence to help us to have a successful year in our firm operations.

The agricultural course of the degree year has been much changed and the direction of change is for it to become more and more practical. Accordingly the Professor of Agriculture loops to give practical training in the new agricultural laboratory. This year the students will have their practical training ander the directions of Mr. Horne, the expert manager of the "will Dury.

On Saturday the 24th June the B. Ag. Class visited the Munit Farm. There was the demonstration of the test of various ploughs on the removal of sugarcane -tubble. The Director of Agriculture, Prof. Kinglit, Mr. Horne and Mr. A. A. Musto the Agricultural Engineer, and other members of the agricultural staff of the college were present on the occasion. The South-bard Chille I plough was found to be the best. The students returned in the intermoon having seen the working of the power sugarcane crusher there installed.

Very 1000 after the University examinations in March, Dr. Mann left for Englant to take a well-carnel and much needed hold lay. We were all very give to have him again among us on the re-opening of the college term. We hope the change has greatly henefited him to enable lum to take in him a ring and dates. Prof. Burns need as Principal, danna, Dr. Mann's absence.

We ten ler our sincere greatings to Mr. S. B. Butani, M. A. B. Sc., who has taken the place of Mr. Mehta as assistant Professor of Physics and Mathematics since May 15th. Mr. Butani who comes from the D J. Sim I college, Kamchi, hears a very high repeation as a scientist, and we feel since that his anxiety and concern for the students will win for him the e-teem and love of them all. We wish him enecess in his dattes.

The work of the foundation of the college hostel is now complete. Farther operations will be resumed after the runs. It is expected that the new quarters will be ready and available next year.

The second block of the college buildings is nearing completion. In fact, the offices of the Frufer-or of Agriculture and the Zoological laboratory have been transferred to the east wing of the block, and the lecture rooms are being attitived. The spacious hall which is a fine piece of architecture is being given the last finishing touches. The library has been shifted from the Chemistry block to its own proper place above the hall. The minguriton of the college by H. E. the Gorenor will take place bowards the millle of July. Preparations are in steady progress to aread His Excellency a Leatty reception and there is no doubt that the college grounds will wear a most pleasing appearance in a short time.

We offer our hearty congratulations to the students who have graduated this year and whose names we feel pleasure in recording below :-

### BACHELORS IN AGRICULTURY.

Patel, Maganlal Laymidas. Lihiry, Kammi Kimpir. Sine, Dhoudo Ginesh. Talukdar, Januara Mohau. Patel, Bharlal Motibhar Bigillot, Govindrio Bhimrao.

Shukla, Chhotalal Kachra. Paranno, Sadishiv Runchindra. Balneh, Chulam Hyder M. B.

Application of Child Service and Princelland

Shukla, Harisakharam Naymtram. Dhurwndkar, Pandurang Goviml.

Diplomates in Agrici Lture.

Ahmed, Fazl Haque. Mazamdır, P. N.

Abhyankar, Dimodar Dhoado. Ildhash, Dosabhar Pingalshi. Medadkar, Dittatraya Sadishiv. Jarimalli, Narayan Bilrant. Datt, Sichimlra Krishur. Halkoti, Bam magonda Yellappa-

gouda. Kathwate, Vishun Manohar. Edaam, Mungharam Nemmal. Vnishuns, Sadashankar Manishankar.

Gupta, S. R. Barakzai, Makomed Usman F. Mamikar, L. S.

and more to properly manufact in the source of the source of It is with the deepest feeling of sorrow that we record here the death of one of our past students-Mr. Pranshankar Juyushunkar Blutt, L. Ag., B. Sc., who died at Berlin on the 5th of Many last. He joined the Agricultural and Science branches of the College of Science in 1902 and passed the first examinations of these courses in 1906. He stool first in all the three Agricultural examinations and passed in the second class at the B. Sc. His course was all along a very hrilli ut one. He was appointed Lecturer in Chomistry at the Agricultural College in April 1907. In July of the same year he received the Sir Mungaldas Nathuhhai and the Bombay Government Scholarships to proceed to Cambridge where he was to study Agriculture and especially Agricultural chemistry. The climate of England dad not agree with his health and he had to return to India. While in India he looked quite healthy and the best medical men adrised him to go back. But us soon as he went there, he uguin became ill and so weat to Berlin last year for change of cliurate. There he became so seriously ill that he could not be removed even to England. His friends knew that he was rery ill, yet the news of his death was a great shock to them. He was so much level and respected by his friends that the impression of sad feeling on their heart can never be wiped off even by tune, but the sail feelings that must have everence his parents and was are beyond imagination. May he rest in peace.

A . C. C. C. C. C. C. C. C. C.

### College Gymkhana.

Since the last issue of our Magazine, the Gymkhana activities were in abevance owing to the University examinations and the vacation which followed. On the reopening of the College on the 1st June, its usual spirit and animation returned with the return of the students all full of renewed vigour to work spiritedly in the field of agriculture and in the field of sport. All were eager to set the Gymkhana agoing, and as soon as convenient, on the 8th of June, a general meeting of the staff and students was held to eject and entrust the vear's business of the Gymkhana to a new committee. The election is a very representative one and we trust will be fruitful of great good, particularly in the fostering of leve for sport and in the spread of fellow-feeling among all the members of the College. In wishing the new committee all success in its operous work, we feel it our duty to offer our best thanks to the retiring committee. We thank specially Mr. D. L. Sahasrabuddhe who for two years in succession as Chairman of the Gymkhana-a department which is as much the essence of a College, as the scholarly erudition which the College aims to infuse in its stulents-did all he could to preserve an even tenor in all matters pertaining to it. Bluny a delicate question is liable to crop up in a Gymkhana which noless delicately handled may disturb its progress. We are glad that the coolness and general disposition of Mr. Sahasrabuddhe paved a smooth course for the successful working of the Gymkhana, and we have no doubt that Mr. S. L. Ajrekar who succeeds him will prove himself as worthy and become as popular as his predecessor. We feel sorry also to lose the excellent service of such able workers as Messrs, Kathavate, Patel, Majumdar, Dutt and Manvikar who spared no energy in the cause of the Gymkhana. We feel confident that the new members will follow their example and do as much and even more for it. The members of the Gymkhana and Magazme Committee are :-

### Secret ries for :

Tennis	Mr. S. P. Sen.
Cricket	Mr. A. X. Rebello.
Football and Hockey	Mr. G. M. Ahro.
Gymnistics	Mr. N. I. Kangle.
Agricultural Association and Debating Society.	Mr. D. K. Kale. Mr. Fred J. Gonsalves
Reading Room	

### MAGAZINE COMMITTEP.

```
' Editors { Mr. B. S. Patel.
Mr. T. Lobo.
Managers { Mr. V. N. Gokhale.
Mr. G. B. Takvalkar.
} Dr. H. H. Mann, p. sc.
Mr. D. L. Subarrahudho, n. sc. L. ag.
Mr. B. B. Jobh.
Mr. Y. D. Waygyani.
```

The different Secretaries have taken charge of their respective duties and already begun carnest work. Mr. Rebelle is striving hard to have a pleasant season in cricket. He has arranged several fixtures with local teams and some matches have been already held. We hope he will be able to get up a gool team this year and win many of the matches, particularly the Challenge Shield Match. Co-operation and sound practice will stand as in gool stead. Let our cricketers join all in the game with a good will and practice regularly bowling, latting and above all fielding if they wish to earn renown for the Agricaltural College.

The Tennis Secretary has had to be busy owing to the fair weather provailing which though propositions for enthusinsts in Tennis is keeping our firm too day. We are glad to note that a new Tennis Court is being prepared on the college grounds opposite the chemistry block.

The Hockey and Foothall department is yet in its infancy, and has Mr. Abro as its secretary. He is just the man for it and will, we hope, inspire enthusiasm among the students to join heartily in the game. Two matches have already been played und the results do credit for a team of tyros such as ours is. We hope Mr. Abro will be quite successful in

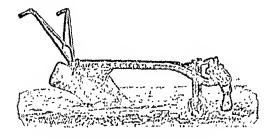
all he undertakes. He ought to be, since he has the lively co-operation of Prof. Barns, who, we are told, is very keen for the game.

There is an improvement in the Reading Boom. A loy has been employed to look after the newspapers and keep the tables in order. We are in receipt of several magazines and assome of them are very valuable, it was resolved at the general meeting that they should be kept in the library from where they might be issued as library books by the students.

### Accounts of the College Gymkhana for the year

	-
Receipts	Expenditure.
R. A. P.	R«. A. P.
Last year's balance319 13 3	Cricket
Donations from members	Tennis344 13 5
of the Staff 80 0 0	Reading Room 115 11 3
	Gymnasium23 0 3
Fees 618 0 0	Agricultural Associa-
•	tion and Delating
	Society 4 8 0
Fees from Tennis tourna-	•
ments 8 12 0	
	Hockey and Football 1 2 0
Miscellaneons 8 2 0	General Secretary 75 6 7
Total Rs 1034 11 3	Total Rs778 S 0
To be recovered 200 0 0	
Total Re 1234 11 3	
Polome with Treasurer	70. 000 0 0
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11	15	**	,,	10		***	38-0-0
55	11	,,	**	12	•••	***	10-5-0
, 13	17	11	"	13		•••	8-H-B
Hand	Chaff	Catter		• • •	***	•••	10-5-0
l'ricti	onlers	Roller B	i-riu	g Im	n Palley	for	
	Wat	લ્કનોદિલ			.,,	***	8-8-0

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# POONA AGRICULTURAL COLLEGE MAGAZINE.



### POONA:

PRINTED AT THE "ARTA-BRESHAM" PRESS, AND PUBLISHED AT PORRE

B

Vishnu Narayan Gokhale

,1911,

### POONA AGRICULTURAL COLLEGE MAGAZINE.

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Mr. T. LOBO.
MANAGERS - { Mr. V. N. GORBALE.
M. G. B. TALWALKAR.

### Members.

H. H. MANN ESQ. D Sc. MR. D. B. JOSHI.

D. L. SAMASRABUDDEZ L. Ag., B. Sc. Mr. Y. D. WAGYANI.

### Notice to Contributors.

The Nagar at the deposal of Professor, past and present students as written legis' and page-ral interest in agriculture. All contributons about low written legis' one one sade of the paper and are onlyect to such needful caneadations may be consistent with their ideas and rejected articles will not be returned.

The Magazine will be published as follows —Ist July, 1st October, 1st January, 1st Murch and contributions are requested to send in their contributions at least one month before the date of publication.

B. S. PATEL,

POONA AGRICULTURAL COLLEGE MAGIZINE.

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tained on application.

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"How long, O Lord, how long?"

# The Poona Agricultural College Magazine.

### Editorial.

FREE write the introductory util le to the Poons Agricultural College Migizine on this or, igon under conditions in which one can have little but sorrow. For over a considerable portion of the country, and particularly of the Bruber Proglemcy the mersoon has been mouth yout and fumme seems the almost inevitable result. The rains broke very satisfurfordly in the early part of June, and gool progress was made almost all over the thunbay Press lency with the sowing of crops. But at the commencement of July there was a curious cessation of run, and daring what is usually the wettest month of the year, practically no run fell in Gapant or the Decem. Early in August conditions changed in the D or in. In the cast, sufficient run was received while in the west only just enough fell to prevent the crops from suffering seriously. Lower Gaurat had enough, but upper Gaurat and Kathiawar were prictically runless. As we write, the shalow of famine is over three British districts, the Bursh State in part, Kithiawae, and the States of Northern Gaparat, within the boundaries of the Bombay Presidence. Already fabler is source, the price of cattle has fallen to almost nothing -- and the thurse crops have largely withered on the ground. If the late rains are good, there is still hope that the worst may be saved .- but that is all.

It seems un fer conditions of coming distress that we ought firstly to speak of a pyrate event such as the opening of the College bindlings on July 18th by H. E. Sir George Clarke, Givernor of Bumbay. A full account of the ceremony will be found in another part of the present issue. It is very satisfactory that after long and weary writing the Pown Agricultural College now has a worthy habitation. We are proud of our new buildings. They are certainly the finest in Poona—and possibly the finest college building in Western India.

The articles in the present number of the college Magazine will be found quite up to the usual standard and we may call attention to some of these which seem particularly worthy of note. In the first place, there are two articles on potato cultivation. One of these is by our oldfriend Mr. R. S. Hiremath, and is descriptive of the methods adopted in the garden district round Belgaum, where intense agriculture is the rule, and land will bring a rent of Rs. 10) per acre. The other example tells of the economics practiced and methods a logical in the far less favourably situated portion of the Kaira district round Umreth, This article is by Mr. M. L. Patel, B. Ag. whose home is in the very area of which he speaks.

We are often asked as to the artial condition of the cattle in an Indian village. Quite recently at Dr. Mann's suggestion, Mr. F. Gracias, G. B. V. C. took up the stude of the cattle of a Decean village, near Poors, with a view of finding out exactly what their condition is. He gives a preliminary account of what he found in the present number of the Magazine, and it will quickly be seen that his experience raises many points of great interest.

The cultivation of the land-local ring our great rivers is always peculiar. The soils are often very deep, very rich, and very well supplied with water,—and such lands are almost always considered to be of great value. The so-called maint lands by the Krishna river form per-Lays the largest such area on our side of India, and the account which Mr. Bhadhamkar gives of what he found there will be recognised as of special interest.

We will only refer specially to one article, that on the improvement of Khardesh cotton. The story which Mr. Kulkarni tells of the extraction of one type from the indefinite mixture which prevails in the Khandesh cotton as u-nally grown is a fascinating one. If the work is continued, and if the people can be induced to select the most profitable cotton for themselves, then, it certainly seems to mean a brighter for ure for this, perhaps ( with Bran ) the greatest rotton growing tract in the East India.

The number of the Magazine is issued at the beginning of the second college term of 1911. We again send it cut, boying that the information which it contains will be found valuable, and also that it will inspire others to collect and record facts of agricultural interest, wherever found, for the benefit of their fellow agriculturists of every kind.

## OPENING CEREMONY OF THE AGRICULTURAL COLLEGE NEW BUILDING.

The following account of the opening of the Agricultural College Building by H. F. Six George Clarke. Governo of Bombay on July 1-th 1911 is taken from the Times of Itela. of the next two days.

INIS Excellency the Governor on Tue-lay afternoon performed the opening ceremony of the new building for the Poona Agricultural College. The event is significant for it marks how the movement in favour of agricultural development in this Presidency has grown since its first humble beginnings as for back as 15.8. From this institution will be turned out not what one might cell complete farmers. Farming cannot be taught by rule of the thumb but only by experience; by men equipped at any rate to make the best use of their land and trained to ineet any difficulties that may arise. Their value to the Agricultural Department is not small. From this source are obtained the experts who do such excellent work in advising the people as to the best method to pursue with regard to their hollings and also by suggesting how best to improve the lot of the agricultural population, north and south and east and west. Not oaly the Government, but also the Native States have realized the advantages to be derived from the employment of men thoroughly conversant in the agricultural problems, while private gentlemen and labourers have shown that they are in no wise behind the times by enlisting from this college trained men who will develop the land to the best purpose. In the router of progress in this direction the Bombay Presidency can flatter itself that it has shown the way to the rest of India. How much of the success of the institution is due to the zeal and energy of the Principal, Doctor Harold H. Mann, it is impossible even to guess. Certain it is that but for his patient perseverance the College of Agriculture would not have been the force in India that it is at the present day. The inauguration of the institution is an earnest of the desire of Government to help the cultivators who form the back-bone of the country. But there are other and pressing calls upon the revenue of this country than agriculture and not all the elounence of Indian politicians can extract from Government more than a certain, though ever increasing, snm. Sir George Clarke out the matter plainly by saying that more research work was continually required. The problems solved by Western countries did not always apply here. More

demonstration farms must be got reattered throughout the districts where the farmers can be taught. Drangelrazine work must be systematically pursued and the younger generation must receive a practical grounding in the elements of agriculture at rural schools. All this demands money. Surely it is not asking too much that some wealthy Indian philanthropist or pull-ulthropists should come forward and continue liberally towards the cause of agricultural education. There could be no better object

There was a large gathering in the central hall of the new building to witness the opening exercison. Decombous were conspicuous by their absence instead of the livish display of flags and builting associated with externouses of this sort. Fresh, green plants distributed round the ball at the foot of the stairs leading to the hinary under the dome and in front of the dass for the reception of the distinguished guests relieved the somewhat bare aspect. The Governor, who was accompanied by Lady Clarke just recovered from a rather everer attrik of freez, was received on arrival by Dr. Mann and the other members of the college staff. Among those present were the Hon. Mr. C. E. Carnichael, the Hon. Mr. M. D. Chambal, the Hon. Mr. G. K. Gokhale, the Hon. Mr. R. A. Lamb, Mr. G. F. Kentinge, I.C.S., Director of Agriculture, Mr. L. C. Swifte, Collector of Poora, and the Chiefs of Bhore, Lohalkang and Miray.

Dr. Harold Mann, the Principal, in asking the Governor to declare the building open, and :-

### Purpose of the College.

Your Excellency, Islies, and gentlemen, we meet to-day to formally open and devote to their purpose the buildings of the Poona Agricultural College in which we are assembled. They represent the present consummation of a movement which has been, with sets-back at various times, increasing in force ere since the most disastrons famine of the last fifty years—that of 1877. A wish to increase the resisting power of the people against a similar visuation by more wilely apreviling a knowledge of the most unportant of the agricultural discoveries of the West led to the commencement, in a very hamble way, of agricultural education, especially intended for those who were to be leaders of the people.

Since that time the whole idea of agricultural education and its value in India has passed through many vicissitudes. After a course was established at the College of Science it was quickly neglected, and rank almost out of existence. Another revival of interest took place twenty years ago, but it rapidly passed away, and both the course and the students almost disappeared. Since the sories of terrible famines from 1896 to 1901, however, a more stable and genuine development of interest in agricultural development and hence in agricultural cluention seems to lavo arisen. And the seal is put to the movement in that direction by the existence of the buildings to be opened by Your Excellency to-day.

### Test of Success.

For these buildings represent in themselves not only an educational institution though clucation is their printer purpose. They are however more than this. They are the centre of a movement, which I think I may say is below felt more and more mone raral orgis every year, in the direction of agra ultural improvement. Let us consuler for a moment the work which is done at this college as a centre. In the first place, this institution is a University College which trains men for a degree in Agriculture, obtainable after three years' work at this College. This is intended to be a course of as high a character as we can make it. The staff will not be content if it is less than the best agricultural course in India. The men when we desire to turn out will certainly not be competent farmers, because there are certain aspects of farming which cannot be taught at any college, but they will, we hope, be men who will have the equipment necessary to obtain, after some training on an actual farm, the best results from the cultivation of whatever holdings they have, and a power to meet difficulties which may arise which they could not have otherwise. The course here is a very practical one. In the field every student has to cultivate land and do all the operations in connection with it with his own hands; he has, ut another stage, to manage an area and present a balance sheet of the results of his management at the end of n year's enltivation. In the study of the sciences on which agriculture is based, an endeavour is made to have the same practical character predominint, and hence the necessity of the fine equipment of laboratories in the two buildings to be opened to-div.

I am often asked where the students whom we turn out go to. Some, and I think on increasing number, other go lack to their family

estates, or else take up cultivation on their own account. The number who do this will really be the first test of the success of any agenicaltural college. Again, the Argicultural Department is staffed from the graduates of this College, and I am very provid of the work which our past students are doing in connection with it, and the enthusiasm which many of them continue to show in the work of spreading agricultural improvement among the people which is committed to their charge. Others again enter the public revenue service, in accordance with a decision of Government some years ago that the presence of men trained in agriculture is desirable in all departments which have to deal with the rural population. Others again are in demand for the services of various Native States. And now a demand is arising from private gentlemen and landowners for men trained here to manage their lands. I have for instance two applications for such men before me at the netsent moment. And there are other demands which time fails me to mention. I am looking forward to the time when we shall have representaures of the training given by this college all over the Bombay Presidency, and, even all over India.

During the last three or four years a demand has arisen for a different course. Many landowners' and farmers' sons who cannot attain to the high standard of general education which is rightly insisted on for our regular course wish to Lave the chance of obtaining the training in the best methods of practical farming which we can give. And hence, we have established a very popular one year's course in practical agriculture after taking which every young man leaves us to put the methods into practice on his own land. The total number of students varies between one hundred and a hundred and and ten. There is no present intention of going much beyond one hundred and twenty. But this educational work is only a part, though the primary part of our activity. We endeavour also to be a research centre in connection with problems relating to agriculture. Every member of our staff is expected to devote time to such work, in other words, is expected to be an investigator as well as a teacher. Inquiries keep pouring on from private farmer, from Government and from local bodies which demand research before adequate replies are given, -- and there is almost endless scope for activity in this direction. The necessity of this work justifies the devotion of a very considerable portion of these college buildings to giving facilities for carrying it ont.

### Varying Activities.

But we are not only this. The college forms in an increasing measure a burner of agricultural information. In public are continually received amounting to thousands per annum, for information, for alvier, for implements, or for seed, to the various departments of the college-Cultivators with the place even from very considerable distances, and in increasing numbers. The officers of the college act as the experts of the Agricultural Department in their various lines, and I am hypeful that this aspect of the college work will contain to good as time goes on.

To accomplish these various activities, the buildings, which we are assembled to open nother have been designed. They were designed by the late Consulting Architect to Government, Mr. Regg, and carmed through under the control of his successor Mr. Wittet. The actual supervision of the work has been in charge of the Public Works Department, and specially of the Expective Engineer of Poors, Mr. W. R. Legis, and his capable assistant Mr. W. E. Debsez. The scheme has root, meloding the machase of the land, sace its initiation about at his laths of rapees, while a further sam of Rs. I, Touler is sanctoned for the construction of a first class college boots!. The man allers builting in which we are met, in which all wick, except that relating to chemistry and physics, will be orecentrated, he out he 4 lakie, while the smaller one devoted to these subjects has regulard a little over Rs. 2 labbe. I am hopeful that a large number of our grass of to-lay will be kind enough to inspect a large part of these building before leaving to-day.

Your Excellency, is the, and gentlemen, before I sit down I must thank you on behalf of the College Staff and myself for your presence here today. We are, one and all, anxious to make this day mush another stage in the development of the great cause of agricultural improvement to which we have devoted ourselves. We feel that your presence to-day inherites your sympathy, and feeling some of that sympathy we shall go forward with renowed energy to the work which has been pieced in our hands.

### SPEECH BY HIS EXCELLENCY,

His Excellence the Governor replying sail :- Mr. Kentinge, Dr. Minn, ludges and gentlemen, -The saying that the best service that an in harland or a Government can remder is to make two blades of grass grow where one grew before, though backneyed, embolies a practical truth too often forgotten. To India it is specially even vitally applicable. And I wish that Indians were more above to its bearing upon the life of the people. The economic position of this country and the prosperity of the masses depend mainly and must always so depened aron the produce of the soil. That is an axiom which each recurring mon-our should impress upon our minds, and while the growth of industries, which is steadily proceeding, will serve to supplement the resources of India and will, to a limited extent, operate as an insurance against by I serso is, agriculture as the bed-rock on which the well-being of the cast majority of the people will continue to rest. Whether the first supply of the world is being a lequitely maintained is a great question on which I cannot enter, but in most countries, India not excluded brees are at work which tend more and more to reduce the producers and to mere we the number of mout's which must be filled by the labour of others Highly in instrudized countries, such as Great Britain and Germany, have cered to be able to feed themselves. The United States, tormerely a great final exporting country, will before long be in the same position, and meanwhile the population is steadily increasing. In the golden age of India when one was rich and happy, an age I frequently hear of but of which I ful to find any traces in history, the population must have been relatively small. Daring the period of British rule it has rapidly advanced to the enormous figure of 315 millions. The production of the soil still feeds this great number and famines have not m modern times cutailed an ab-olute deficiency of the food supply of luder as a whole, but only the enhancement of prices due to local scarcity and to the co-ts of transport. In the future a much larger popualtion will have to be fed and it is probable that the number of producers will relatively decrease. What available reserves of land

exist to meet the growing demands cannot be exactly estimated. In the statistics for 1905-9 the cultivable waste other than fallow for all India is returned as more than 113 million acres. This is a larger area, but much of it, nuless climatic conditions change, will never be productive without irrigation. In our presidency alone we have more than 7 millions of acres of such waste land, of which more than 5 millions are in Sind. When the great Sind irrigation project is carried out much of this waste will be turned to productive account and added to the nearly 34 million acres already irrigated in that province In the Presidency proper we had in 1908-9 about 893,000 acres of irrigated land to which additions have since been made, and when the fine project of the Nira Left Bank Canal which I carne-tly hope to see began before I leave India, is accomplished, there will be a further increase of about \$50,000 acres. By means such as these a part of the available waste land of India will be enabled to mil to the food supply of the people in the fature, but much will remain waste for ever. Irrigation is possible only where the conditions are favourable, and while in specially dry areas projects entailing un annual loss are justified by reason of their great indirect advantages it is a sound general principle that the large schemes should pay their way. I have so far dealt only with the question of agriculture in its relations to the food supply of Inlia, but there is another most important aspect of the matter to which I referred when opening the Agricultural Conference in Poons in 1909. The total export of articles of food and drink, the produce of the land in 1909-10, was valued at more than 321 milbions sterling, showing an increase in five years of nearly 44 millions sterling. In the same year the value of the total export of the produce of the soil was about 81 millions sterling. This means that India received from abroad as profit from the cultivation of her land a sum more than four times the land revenue and 32 millions greater than the net total expenditure of the Government in that year. The immense economic advantage of this hage transaction must be evident, and there is an important added grin resulting from the surplus production. It creates a reserve available for the needs of the worst years and, as was shown in 1900-1, the export of wheat instantly dropped to trifling figures. I hope I have said enough to indicate the vital importance to India of Ler agricultural production. If that production can be increased the whole country will benefit immediately, and certainly now, The cropped area

of the Presidency, including Sind, in 1908-9 was more than 29 million acres, very nearly 20 million acres being devoted to food stuffs and pulses, and more than 31 millions to cotton to which we allot a greater area than any other province in India. To jowari and bijri we assign an immensely larger area than any other province. Accurate figures giving the production of these areas are not available, but in my address to the Poona Conference I pointed out how low the average is in the case of wheat and other staples also do not nearly reach their possible output. When one is dealing with the hage areas under entitation in India little imagination is needed to grasp the fact that even a small average increase of the present production would mean an immense total gain to the people apart from that which would accrue from improvements in quality and from the introduction of new products. And this brings mo by what I fear must have seemed a tedious route to this College which represents in concrete form the earnest desire of the Government of Bombay for the greatest interest of India-the interest of the land. Dr. Mann has given us a skotch of the rise of this important institution from a small beginning. It started with the theory only. It is now largely devoted to practice Elementary classes which at first fell off in numbers developed into the training of a high standard with numbers of graduates yearly mercasing, and the Poons College of Agriculture is now steaduly growing in popularity and becoming a centre for instruction, for research and for the diffusion and reception of information of all kinds relating to the vital industry of India. It seems a long time siece I visited this Institution, and I am very glad that before leaving India I am to have the bonour of opening the new buildings which will add greatly to the comfort and convenience of the staff and pupils and consequently to general efficiency. The report for the last year should be carefully read by all who take a real interest in our cultivating classes. I find in it causes for hope and ahundant proofs of steady progress, but also plain inducations of the large amount of work that remains to be accomplished and of the pressing need for such work. The College now provides two courses: one of three years' learning to the degree and a short course of one year of which at first the success appeared doubtful, but which, I am glad to know, now has 12 promising students and is likely to grow in popularity as it becomes more widely appreciated. I hope that in time we shall obtain more students from the well-to-do classes, who after taking the full course would be able to add largely to the profits of their families and would set an example of good farming to their tennats and neighbonrs. The students taking the one year practical course are all the sons of landowners, and I trust that they will also increase in numberand turn to full account the training that they receive. I am glad to note that last year 25 graduates of this College obtained appointments. which shows an increasing demand for trained agriculturists and should prove an encoaragement to others. I agree with Dr. Manu that Government should show special consideration to graduates in Agriculture for appointment to the Revenae service. The establishment of a Marathi school is a fresh departure which, if successful, will, I hope, bo followed by a guirrathi and a Canarese school. The experimental work of the Department, though restricted by the other claims upon the time of the staff, has been important and valuable. It is to this branch of activity that we owe a great advance in the cultivation of Broach cotton in the Sonthern Maratha Country as plainly shown by the increase of the value sold at anction from Rs. 8,398 in 1908 to Rs. 1,11,455 in 1910. while the hybridized Kumpta obtained prices 71 per cent. above the onlinary quality, and special seed is aed from the Sarat farm give an increased profit of 5 per cent. The growing demand for the seed provided by the department is a very hopeful sign, but we have yet to teach the cultivators that if they allow their seed to be undescriminately mixed every year the advantage disappears.

In demonstrations, shows, district work, and the issue of publications, to all of which I attach great importance, there has been a marked progress. A total of 17 shows and 59 demonstrations and lectures, together with the formation of twelve new agricultural Associations during the year, indicate the growing local interest in the great cause of agriculture. The Decean Agricultural Association has started a useful monthly Marathi journal. There is a College magazine to which students mainly contribute, while the many bulletins and leaflets issued by the Department have added largely to the knowledge available for those who are willing to learn. Much more might be said as to the work which the Agricultural Department is carrying on, but I must not detain you longer. I warmly congratulate the Director, the Principal, and the staff on the progress which they have achieved in the short time which has clapsed since this College was opened. The results they have already obtained afford a striking testimony to the zeal and ability which they have brought to bear on their important duties. I find only

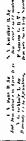
one fault in our Agricultural Department. It is far too small in comparison with the needs of the cultivators and the vast magnitude of the task which it has nudertaken. If I were an Iudian politician I should worry Government in serson and out of serson to spend more money upon the improvement of agriculture and the acquisition and spread of knowledge. We require much more research work, hecunes the problems of Iudia are her own, and the careful investigations carried on in other contries may be valueless in our special conditions.

We want more demonstration farms where the cultivators can receive object lessons by which the advantages of improved methods can he brought home to their minds. I should like to see many more lecturers employed in going about among the villages to instil new ideas and to awaken interest. I think we should also establish rural schools where the elements of practical agriculture could be taught in the verpacplar. All this requires funds. And the demands upon the Government are now so many and so insistent that we cannot do nil we wish-This fine College is, as I have said, a proof of our carnest desire to help the cultivators, and you may be sare that we shall continue to do all in our power to extend the beneficient work of the Agricultural Department if the nature and the vast importance of this work were more widely known. I am certain that our many wealthy and generous philanthropists would come forward to help it realizing that there can be no better pooof of patriotism and no better way of promoting prosperity than the increase and development of the production of the land which lies within our power if adequate means were available.

In conclusion, I wish to say a few words to the students of this College. I hope you all feel that the profession of Agriculture is as homourable as it is ancent. Among the many educational institutions of the Presidency mone is more practical or cayable of doing more real good to the masses than this. I hope a time will come when the degree of B. Ag. will be held in the highest estimation and will be eagerly sought after by those who wish to promote the prosperity of India. What you are learning here can be turned to rich account hereafter, and while you may not be able to make two blades of grass grow where one grew before, because that means an increase of 100 per cent. of production, you can with absolute certainty add to the wealth of the country and to the well-being of its people. That should be to you an encoraging thought, and I warmly congratulate you on the line of life you have chosen and









H. H. Amergenis I. Ag.,

Dermorted and active in the Commerce of the Commerce

wish every success to you individually and to the great cause of the land in which you can be act to and patriotic missenaries.

In moving a vate of thanks to His Excellency for his presence theorethat day Mr. G. P. Kestings will the kind words apoken by the Governor would prove a great encouragement to the Department of Agriculture as also to the members of the College staff and the students. The Hon. Sirlar Cooperswamy V. Ma Hear who recorded expressed the keen regart felt by all members of the community that the term of office of Six George Clarke was so rapidly drawing mar to its close. The Governor afterwards processed to the first of the great staircase and heading a cord which larred the way deduced the College open and wished it every success in the future. The various rooms with their many interesting exhibits were afterwards maps to by the greets.

### Demonstrations & Exhibits on View.

### Zoological Laboratory,

- 1. Wild allk moths of India, els framed pletures.
- 2. Moths of one of the above wild rilk moths (Antherea mylitta) with eggs and coroon
- 3. Dri allk moth ( Attacus ricini ) in all stages.
- 4. Mulhorry silk moth, in all stages,
- 6. Spinning of orl allk,
- 6. Lac, grown near Poons by Mr. T. R. Ketwal
- 7. Various wood-boring insects,
- 8. Various agricultural pests,

### Laboratory of Plant Diseases.

- 1. Microscopic slides of fungi causing plant diseases,
- 2. Specimens of diseased plants.
- 3. Method of combating Grape Vine Millow by Bordonux mixture.
- 4. Methods of fungus culture.

### Retanical Laboratory.

- 1. Mango grafting, Mango diseases, Mango Irulia, etc.
- 2. Method of making microscopic alldes,
- 3. Microscopic slides with drawings.
- 4. Experiments on the physiology of plants.
  - 5. Prolis from Gancaldhind Gardon.
  - 6. Ilbres.

### Herbarium.

- Demonstration of methods of preserving plants.
- 2. Herbarium epecimens and their arrangement

### Agricultural Museum,

- Rocks from the Bembay Presidency,
- 2. Ohief minerals compesing the above rocks.
- 3. Seils from various parts of the Bombay Presidency.
- 4. Manures available in this province.
- 5. Crops suitable for green manuring.
- 6 Samples of crops grown in Bombay g. Pulses
  - Jowar
    - 6. Bairi A. Orlseeds
    - Maizo i. Fibres d. Wheat
    - t. Gardon Crops and Vegetables e. Rico
    - /. Millets Green Fodders.
- 7. Implements in use or recommended by the College for use in the Bombay Presidency.
- 8. Models of apparatus recommended for gul (erude sugar) belling.
- 9. Dairy appliances,

### Physical Laboratory.

- 10. Photographs of Dairy Animals. 1. Students working determining
  - a The gravity of nee seed,
  - b The saltness of water by determining the gravity.
  - e. The volume of fruits and nuts.
  - d. The energy required to raise a body by various combinations of pulleys, and other mechanical devices.
  - e. The atmospherie humidity.
- 2. The antematic waterfinder.

### Chemical Laboratory I.

- 1. Milk analysis.
- 2. Separation of engar and molasses by contribugal power.
- 3. Machines for campling
- 4. Determination of the value of manures by determination of Nitrogen.
  - 5. Analysis of oilseeds by extraction of oil.
- 6. Analysis of soil, -determination of organic matter,

- 7. Lemou grass oil distillation.
- 8. Analysis of water for drinking-tests with Potassium Permanga-
- D. Determination of salts centained in soils,
- 10. Sugar analysis, Politing's mothod.
- 11. Exhibition of Bombay Drags.
- 12. Olls and ollsoods from Bombay.

### Chamient Laboratory II

- Detection of adulteration in flour by examination under the interescope,
- 2. Detection of adulteration in batter ( two matheds ).
- 3. Determination of the stickings of soils by florenistion.
- 4. Measurement of colours by the ilutemeter
- 5. Polsonous principles of plants ( aikaloids ).
- 0. Minerals of the Hombay Presidency, collected by students.
- 7. Rocks of the Rombay Prosidency, collected by students,
- 8. Typical specimens of minerals and rocks.
- 9. Proparation of rooks for examination under the inferescops,

# Potato Cuitivation in Umroth in the Kaira District.

### uY

### M. L. Patel, B. An.

All III special pocularity in potato cultivation in this tract is that it potatoes are taken as a winter crop as well as a summer crop. In the former case they are grown after the kett or red pumpkin a valuable garden catcherop, and in the latter case, they are taken after ginger.

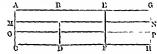
This practice of taking an irrigated garden crop like potatoes after given in the same year is analogous to the practice pravaluat in Start District of taking the small variety of Brinjala (Solanum Melongena) after given. This method is economical to the the cultivators as they have to spend very little for manure and tillage, glager being heavily manured with cuttle manner and also with caster cake. Further more the harvesting of ginger leaves the hand in excellent tille. This is the most general practice, but in parts of Unitoth other methods are adopted, the series sometimes ising:—(1) Hajri (2) Petatoes (3) Smallin Jowar.

After the field is ploughed once lengthwise, the Handwar (a wooden plunk with a hig stone upon it) is need to crush the hig clods. After working this Anndwar, a second ploughing takes place across the line of the first cultivation.

Subsequent to this ploughing, one basketful of manure every four squre fact of surface is distributed. This comes to about twenty fact to thirty cut leads per acre. There is also in vegue the practice of putting manure on the land soon after the removal of potato in March. This dressing of manure brings a good return of grass. Some cultivators supply manure to the potato lands every second year. Some quantity of manure before the grass and some before planting potato is calculated to yield on the whole very satisfactory results.

After manuring, the handwar is worked accompanied by the plough for the third time. Ploughing, using the kindwar and crushing clods with a wooden hummer will be carried on again till the soil acquires a proper tilth.

When the soil is in a satisfactory condition the plough is used to make farrows and ridges along the keight and breakful of the field. Furrows along the breakful of the field are at the interval of full two strides (about seven to eight feet). The area comprised within two consecutive cross furrows is known locally as "Wari".



AG, MN, OP, Cfl are the rows lengthwise.

Lines AC, BD, EF, GH are cross farrows.

ABCD, or BDEF, or EFGH is a 'wari'.

The distance from A to B, or B to E, or E to G is full two striles.

After the cro-s furrows are ready, all the furrows and ridges that are deformed a little by working men and bullecks are repaired by hand and made convenient for planting sets and watering.

Cutting and planting sets:—As soon as sets are cut from the middle sized tubers, they are thrown in ashes so that evaporation may not take place from the cut surface. If avaporation is allowed from this part, seedlings will turn out weak, puny and unthrifty. In

October or in the <u>beginning of November sets</u> are put in the furrows at three nucles spars and water is given immediately afterwards. A slight dressing of asies before planting sets is deemed bonefamil or stimulate good growth. In dibbling the sets core is taken to one as little pressure and friction as possible lest they should rub argumst soil. To effect this, the earth is removed with three fingers (little finger with the two alycining coes) and then untantly a set held between the other two fingers (thamb with the



For parent one

one near to fi ) is placed in pression. The operations of removing earth and putting down sets take place automatically. The sets thus placed are afterwards overeid with the same three singers, that were employed to remove the migh.

For one arre ten bage of private of seven maunic each are necessary, a maind bring twenty six lits. This works out as about

1800 grands of soot prestors per sore.

Watering:—The first watering takes place soon after the sets are brief in dry earth. The second and third waterings are given at internals of eight days. After twenty days when plants have entiatined the bright of fire or six inches, weeking and terelling ridges with a Karpa commone. After getting all the bels fat within four days, fourth watering a date. Four or fire days after this fourth watering, when the send gate a little day, now formores are prepared between the rows and the fifth watering is applied.

After one month the crop should be in full vigour of growth and will benefizated require water every founds art fill the end of the second month. In the third month the crop will be ripening and will the month require water again every eighth day. Watering its allogater stopped files days before the inhers are removed from the ground. Weeks are to be removed as soon as they appear.

There will be usually cabbage, knolkel, cauliflower, radish and onion along water courses surrounding the potato Waries .. Hulichikla (country sorrel) is also grown on bunds. Red Harigi (red amamnth ) seed is sometimes broadcasted in beds of potato and young plants removed early for sale as a green vegetable.

When the crop is ready, plants usually have become bare of almost all leaves, and the handms which are straight and stardy in the second month, gradually become decoping and withering in the third month. Tubers are first due up with alpuckage as far as possible and then the plough is worked to stir out the romaining potatoes.

The yield is usually eight times the seed (i. e. 560 manuals to 600 manuals or about seven tons ) and sometimes gives as high as ten to twelve times the amount of seed. The price varies from eight annas to one rapee per manual of 28 lbs. The total value of the crep varies from Rs. 290 to Rs. 300 per nere and may even bring Rs. 500 to Rs. 600 when the market is high on account of much demand from Dharwar and other places.

Total expenses per acre: -C'out of anishmatia

Rs. a. p. 18 0 0

٤.	Cost of cattivation: -			•				1
	Three ploughings at	Re.	2-4-0	ner.	3.	a.	ъ.	
	ploughing per acre Using handwar three to			(	1	12	0	
	Justing handwar three ti	mes :	at Ks. 1	-8-0				

per acre per time Crashing clods, 12 women at as. 2 each. 1 Making forrows and ridges ...

Making furrows neat and bedding by Cutting and planting sets, 24 women pre required ut us. 2 each ...

18

- Cost of manure, 25 cartloads at Re. 1 per cart. Cost of seed, 70 maunds at Re. 1 per mannd. ... 70 0 0 Cost of irrigation:-
  - In three months about 19 irrigations (5 in the first month, 9 in the second month, and 5 in the third month) are wanted. Fer irrigating one nere in one day two prirs of hallocks (each pair werked alternately), two men with a mot and one man for regulating water in bels are required. The cost of this comes to Rs 1-12-0 per acre per time. Therefore for irrigations Rs. 33-4-0 are required.

5.	Harvesting an ac	re includi	og diggir	g aleo	10		
6.	Rent per acre	•••	•••	•••	100	0	0

Total R ... 236 4 0

Net proft:-

Rs. a. p. 300 0 0 256 4 0

43 12 0, excluding Rs. 60 to Rs. 80 per

acre secured for grass.

Full work can be had for three men and two pairs of bullocks on an area of four acres with one mot working on a well, fifteen to twenty feet deep.

# Malai Cultivation along the Krishna Valley in Satara District.

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### B. R. Bhadkamkar.

IN the month of May 1911 while I was with my brother at Tupari near Takari station in the Satara District, my attention was drawn to the cultivation of these radio. land.

My object of giving this information is due to three facts which I observed particularly. There are as follows:--

- 1. The same crops are cultivated each year on the same land.
- 2. The fact that these lands are considered of extreme value by the owners.
- 3. The crops grown are not of the great economic value that would be expected under the commentances, and so there seems a considerable field for agricultural progress in the direction of introducing new and more valuable crops.

Considering the above three points I think it will be a good plan to give some information which I have editected of these lands and their cultivation.

It is rather difficult for me to give an accurate idea of the character of the malai lands. But I may say generally that the sloping areas

along the bruks of the river Krishna which give so much pleasure to the eye and beauty to the river itself, are called mulai lands, and with these also, the lands that are reclaimed from the river are included.

Owing to the very winding and zigzig course of the Krishna river, the population of a large part of the Satara District benefits every year, by the addition of fresh salt to their lands. This silt is particularly rich in organic matter and humms. It is supposed that a man possessing five acres of malar lands is far superior to a man holding fifteen acres of good ordinary soil.

The reclaimed lands are rither inferior in quality when compared to those that are covered every year by the floats of the triver. This is also to the fact that these are not evered with sit in the same way each season. They are commonly known as depth (TIPHE) lands.

Having understool the type of land to which this article refers we may now turn to see the kind of soil which is usually found in them.

Generally speaking, three distinct kinds of soils are found .-

- (1) Valusara soils ( पार्टारा ) us they are called in the vernacular. These are mainly composed of very fine sand.
- (2) Soils composed of silt which has been washed away by the waters of the river. These lands are commonly termed Galvet (π<sub>12</sub>π<sub>2</sub>) had so literally lands full of mud. The name itself is explanatory of the kind of sell which it forms.
  - (3) Dagad lamls which I have already mentioned.
- I. Firstly, let us consider the Valusara or the samly soils as I have called them. These sandy soils can be further divided into two classes according to their situations:
  - n. Sandy soils on the steep slopes of the bank.
  - b. The sunly soils on the level.
- a. Sandy soils on steep slopes:—These are purely composed of very fine particles of sand, quartz and disintegrated trap. The quartz gives them a whitish colour while the trap particles give them somewhat shining black colour. To an ordinary eye the soils present a somewhat shining greyish colour. The depth of these soils depends upon the inclinations of the slopes, but generally it varies from four feet to even twelve feet. By day these soils become so but that you cannot walk through them. They are very persons and any excess of water is natural-

ly quickly drained away, only sufficient moisture being retained for the particular crops that are grown in these lawls. Even in the hot weather we find thee soils most at the depth of four to six feet. Organic matter is n-unlly present in very small amount.

- b. Sandy soils on the level:—These soils do not differ very much from those on slopes, but they may vary in some parts to a small extent. In the first place, the colour tends usually to he a light pale red, slightly marked with black tints. If one walks through these soils, it is at the end of the field that the feet are coloured pale red. In composition these soils do not vary very much, but as their position is on level ground any small amounts of salt, washed down by the river, accumulates on these only. The soils are light, friable and extremely well a rated.
- II Galuat soils or silt soils -A the name indicates, these are mainly composed of silt washed down overy year by the river. The situation of these soils is just above the level sandy soils with which I have just dealt. These soils take a middle position between the sandy and the Dagad lands. These soils are very highly valued by the cultivators, as they are extraordinarily productive. In the case of these soils the owner does not need to conduct expensive tillage operations. Further more the cultivator has no need to shend large and increasing amounts of money for manure. They do not need manuring at all, in fact, because a sufficient quantity of manure is added to these soils in the form of silt by the river waters. These soils are loose, well negated and are of a light chocolate colour. These soils are most retentive and their water-holding capacity is also great. The peculiar structure of these soils allows full scope for the capillary rise of water when it is reomired. Rotation of crops is rarely practised in these soils. Some standard crops are grown every year, and the reason for this is quite clear, as they are annually renewed by the river.
- III. Daged lands:—As has already been described these are lands reclaimed from the river. The situations of these lands are just above those termed Galucat. As these are rarely flouided by the waters, they have become much more hard and compact than the former. In these soils, rotations are practised and these lands are even montred though not every year. As surface wash is a continual danger on these lands, the cultivator has to take much care about them. These soils are very

deep and also retentive, and will be found to contain a much smaller proportion of sand than the galeat type. In these soils the system of cropping varies in different parts of the district.

The method of cultivation of each of these types of land may now be described.

- I. Valusara Lands:-
- (a) Sandy soils on steep slopes:—The ordinary kind of agricultural operation such as ploughing, harrowing, and the like is not carried on at all on these lands. Generally the first floods pass away at the time of the festival of Ganesh Chatarthi fortuight of Angust. When these floods pass away and the soil is still somewhat moist, men are engaged to dibble the seeds. As it is very difficult, if not impossible, task for hallocks to walk on these sloping soils, as, far as possible hand labour is engaged. The following mixture is invariably sown by all the cultivators in these soils. They mix together four pounds of maize, four pounds of castor seeds, one pound of sheer; seeds and four mounds of pacata (Daliches labled) seeds and dibble this.

This amount will sow a highs. The dibbling is carried on with a small kurpa ( पूर्च ) or a special kind of spide ( पूर्च ). They dig a small hole by it and throw two and three seeds of the mixture. In this case the distance between the rows is generally from ten to twelve inches, and between the plants at is almost five inches. This distance between the plants and the rows is found suitable to the conditions and the people say that any change invariably results in a lower yield.

(b) Sandy soils on the level:—The working of these soils hegins nearly at the same time at which the dibbling is begins in the sandy soils on slopes. Being level soils bullocks are freely used for work, and in these soils some previous tillage operations are con incted. When the soil is still comewbat moist, they are ploughed. As these are very easily workable soils a plough is used requiring two or two pairs of bullocks. There is no necessity of harrowing or levelling the fields. After the plough the cultivators immediately use the seed-drill for sowing the mixture that is mentioned in the case of the soils on slopes. But in this case the rate of the individual sorts of seeds is doubled and so it runs thus:—

Maize ... S lbs.
Pavata ... S lbs.
Castor ... S lbs.
Sbevari ... S lbs.

There is every reason for the increase of the seed-rate. In this case the seeds are sown deep, and it is possible that some of the seeds my not germinate. Again, if some germinate there is the chance of some of the growing seedlings getting choked while they are coming up. Thirdly the seeds are sown by the seed-drill. In this case the distance hetween the rows is from ten to twelve inches as hefore. Almost all the cultivators do not conduct inter-tillage or weeding operations. Being sandy soils there seems to be no necessity for them, and if they were to conduct those operations, then the expenses of rising the crops would considerably increase. Beyond this, these soils are not much infested with troubles of deep-rooted noxious words. The free aeration and the looseness of the soils provent to a great degree the grawth of many weels of this type.

## Harvesting, Economic Importance of the Crops &c.

Maize -After four mentles from the time of sowing that is in the month of December they harvest the maize cmp. With sickles they cut the plants keeping in the ground the stumps about three inches high. The plants are tied in bundles and kept in the sun for drying for about four or five days. After they are dried the cobs are taken off hy the hand and the dry material is used for burning, as it has little or no feeding value. The cittle at least do not eat it with relish. In this district maize is grown not as a staple fool crop, but it is often produced as a green folder cmp for cattle. No doubt it forms the food grain erop of the poor low caste people only, but it is not so much valued here. The munature green cohs are widely eaten by the people after partially baking them in a grass fire. For seed-purposes good stont plants bearing strong and healthy cobs are selected and after drying them along with outer membraneous coverings are kept hanging to the ceilings of the houses. At the time of sowing these cobs are taken out and the seeds are shelled out by hands and then they are sown.

Parata .—The Caltrators mostly prefer the black variety of the parata and reject as far as possible, the white one. The reason of this selection depends apen the economic value of the black variety over the white one. This privata is sown mainly for folder and less for seed production, it being seen that the foliage expanse of the black variety is far greater than the foliage growth of the white one. This black variety produces a bigger and stoater growth which is suited to the conditions of these soils.

It has also been found out by the cultivators that this black variety is distinctly preferred by the cutto for cating. These pretata creepers are not fel to the cutto while they are green. But they are fed after they are preceded from the fields at the time of barvesting.

This preata crop begins to ripen from the fourth or fifth month from the date of sowing. The first packing of the pods commences in the month of December and the next packings are contained every week. These pickings list one month only by the end of January the pickings are completed. After this, the croppers are approved but are rarely cut. They are directly fed to the cattle or they are mixed with a particular kind of cuttle feed which is known by the name of Bhussa (SHI). This Bhussa forms one of the chief materials of folder for milch cows and huffaloes and even for bullocks. This Bhussa consists of many things, the principal of which are as follows:—the dried levves and huffaloes in the threshol cur-bends of the powers and begin crops; the dried cropers of the legaminous crops of various sorts i. e. mag, matati, udid, masser, pacara croppers &c. &c.

Caster:—From the beginning of the fourth month the fruits begin to appear on the pluts and from this time the collecting and drying of the seeds is continued. The pickings are continued for six months that is, until the beginning or maddle of May. The caster seeds are used for various purposes. The clust of which is for the extinction of caster seed oil which is generally used for humang purposes. The cake being uncitable is not fel to the cittle last is vastly used in this district for the municing of sugar-cane crops. A second bat rather important use to which these caster plants are put is for folder purposes for ordinary cuttle. From the fourth month infter sowing the young leaves and the top-shoots are fel to cittle. These leaves do not seem to have any special feeling value had then exerce as an addition to the other dry folder. Of course, one must remember that the nipping of the young shoots to it to the production of the new branches which are needed by the cultivator.

Thus these castor plants are allowed to grow throughout the year. When in the next year the floods come in, these plants serve two chief and important purposes from an agricultatal point of view.

(1) At this time the plants become very hig and send their roots very deep in the soil. When the floods come these plants stand

in their places and do not allow any soil to be removed by the running waters. Thus any soil wash is stopped-

(2) These plants serve to hold the new silt. The silt and mud is thus not cirried away by the waters when the flools pass away and when the cultivators begun to plough the lands. These caster plants are out off and are used for humang purposes or for bailding small cottages. They are much valued for reofung purposes.

Sherare:-This is chiefly grown as a folder crop and it has no other value. From the fourth month after sewing, or when it is six or seven feet high the prinning of the plant begins. The young shoots at the top, and the side-brauches are then cut and are fed to cattle. This pruging helps the plants to develop new side-branches and much green folinge. Being a fodder crop the main object of the farmer is the production of many side-branches and as much foliage as possible-Therefore they are pruned frequently by entting with a sickle when they are nearly four feet in length, and feeding the prunings to cattle. The cows, bullocks and buffaloes eat this fodder greedily. Any dry fodder if given along with this Shecari is consumed by the cattle without any trouble. The ordinary farmers who are not in a position to grow irrigated lucerne consider this sherare as its equivalent. It is found that if miltch cows and buffuloes are fed with ten to twelve pounds of Shevari every day, the milk produce is increased not only in quantity but also in quality. Sherar, can be fed to any cattle in any month without any fear of harming them. But there is only one point which is to be succeally noticed and if it is neglected then the result is said to be the death of many of the cattle. If it chances to min in the month of March or April or in hot season, the shecari plants grow extraordinarily rapidly. In one night I have seen them grown to a length of two or three inches. If those newly grown branches of sherari are fed to any cow, buffalo or ballock, the animal is certainly made vory ill, and often dies. Nobody knows the reason but there is no doubt as to the fact. Hence great care is taken about feeding hot sesson sherari. At this time nobody allows his cattle to run about in the fields of shevars. On the other hand, if there is no rain in the hot weather, and the sherari is fed to the cattle, no inurious effect occurs.

The shesari crop is allowed to grow in the field during the whole year, and then at the time of ploughing the field, the plants are cut and stored for burning or for thatching roofs. At this time of the year the plants have grown to a height of fifteen feet and are strong and stout. Just as the custor plants serve the purpose of holling the soil in together and of preventing the surface wash at the time of the floods, so also do the skecar: plants, and the enting therefore takes place after the floods are rast.

Outturn:-The average outturn of the crops may be taken down as follows:-

Parata :-- 8 manuds per nere.

Maize:- 4 ,, ,, ,,

In Tasgaon they only grow maize and castor and not shetar: and parata. So the outturn of maize there rises much higher and varies from ten to fifteen manuals per acre.

Diseases:—Sherarı anl custor crops are not affected by any diseases when grown on Malat lands. Parata is affected by Aphis, or pepadi (प्रार्क्ट) as it is called. The leaves fall to the ground and the leaf growth is checked. The pods obtained are empty or only contain shrivelled contracted seeds. Though it is not a major pest yet the damage is very considerable.

Maize is attacked at the time of flowering. The inflorescence is attacked by white caterpillars which eat off the inflorescence itself. When the plants are time attacked, the cols remain quite empty. The seeds are not developed. Kaadeluri; (xizyr) is the common name by which these caterpillars are known in the district in question.

### II. Galwat Lands :-

At the time when the river water has completely gone down to its original course, that is, about the beginning of (ambar) September the cultivators commence the first operations on these fields of cutting down the matured shear's crop of the previous year. The individual plants are cut by means of a peculiar spade adapted for that purpose, generally known by the people by the name of Bedage (and). Near the base of the plant a small pit is dag by the band and then, the plant is cut by the bedage deep in the soil.

When the soil becomes workable so that bullocks and men can safely go in the fields the plonghing of the lands begins first cross-wise and then length-wise. With a harrow having extra prongs natuched to it, the soil is worked only cross-wise for three or four times. This serves the purpose of pulverizing the soil to a fine condition. By this harrowing the clods that are formed are reduced to powder and the soil becomes quite loose and finable. If trunblesome weeks like Lavala, Hariali, and Daqad (2702), a kind of creeping and climbing weed, are present the land is worked again by a secul-drill without the tubes. After they again harrow the land twice at least then it is levelled. Special attention is given to this operation. By the floods a great deal of change takes place in the surface level off the lands and so people deem it best to level the lind as far as possible. After this levelling they pack the soil by working on the soil the figs of a heavy big harrow. This is done with a view to conserve the moisture in the soil. The tillage operations, as will be seen, vary to a great degree from those conducted on any other ordinary lands.

After this, sowing operations begin. The mixture that is used is the same as that used in the case of the relicerar lands, with the exception that shalle power is put in place of castor. This mixture is sown in the following way.

Parata is sown in each eightth row and usually maize also at the eighth row, but sometimes at the fourth row. It is found that if maize is sown at the fourth row the jowar does not grow nearly so well. The growth is, in fact, so much checked that the outurn is very small. The reason for this is, as yet, quite naknown. But maize at the eighth row does not maternally affect the growth of shall yowar. Sherari and shall yowar are mixed and sown in the remaining rows.

Generally a four coultered seed-drill is used for sowing, while parata and marze are sown by the many or one-coultered seed-drill,

In this land a special area is preserved for the plantation of the wild-known Krishna Valley brigials. The previous operations of these brigials are rather different and so I think it worth giving a few lines describing it. The preparation of the land is of two kinds.

Ist way:—The land is prepared just as in the case of land for shall jouar, sheari &c. &c. and then in this prepared soil the brinjal seedlings are transplanted, the distance each way between the plants hemg thirty inches.

2nd way: --The seedlings are transplanted into land which receives no tillage of any sort not even ploughing. The distance between the plants is the same. In the first method the field is weeded every eight days at first and then as the weeds become less and less the interval of days between weedings is increased up to twenty days or more, till all the brinjals are collected. Immediately after the first three or four weedings the space between the plants is harrowed by a peculiar sort of harrow, which is kept for thus purpose alone. Thus constant harrowing forms an excellent muched over the soil which helps greatly in the preservation of moisture. It also tends to stimulate the vigorous and healthy growth of the plants. By these harrowings, the lower part of the plants is covered by loose earth which serves as a sort of "carthing up."

In the second method, harrowing only is carried on every fourth day, by which means the expensive and trouble-ome we dings are render d quite unner sarry. At the time when these plants natain n height of eight nuches, pruning of the leaves commences. this operation is done without fail once in fifteen days, and is carried on till the plants stop yielding any farther crop. The importance of this operation cannot be over-rated. The first thing that is gained is the outgrowth of many side-hranches by means of which the yield of fruit is increased to a great extent. Again, the plant sap instead of being washed in the production and nonrishment of new leaves is athlived for the development of the fruits. The plants when fully grown uppear like a bush about four to five feet high. The plants begin to hear from the third month, and the placking is carried on every eighth day till the plants stop yielding. With stocks in their hands, the men turn up the hranches and leaves of the plants by which the bringals are visible and then with one slight jerk the fruits are pulled off. The first pickings yield brinjals large in size, slightly grey, with purple lines, somewhat sweet in taste-a peculiarity of the brinjals of the Krishna Valley. The seeds in these brinjals are very few in number. The fruits weigh from four to five pounds each. As the plants become older and older the number of fruits obtained decreases and they become smaller and smaller with a change of taste also. The number of seeds also increases. They are, however, produced until the month of June, when the last picking is over. The plants are generally approated and used for harning purposes. But sometimes some cultivators cut these plants keeping above the ground about three or four inches of the stalk and allow it to grow for the next year. This is practised but by very few on the reason that the ontturn produced is very small, and the plants are apt to be diseased.

Though the yield of this crop is very heavy yet the want of a proper market has caused the return to the people to be comparatively small. A recent attempt to send the produce to Bombay direct was not successful as the returns were exactly equal to the expenses, as both road and rail postneys are long.

The Krishna Valley caten raw, besides brinjals being a delicious vegetable, are an excellent medicine for bowel troubles,—the best way being to take them in an early morning.

For seed purposes a strong healthy plant is selected. The fruits of this plant are not pincked at all but are allowed to develop. The pruning of the leaves and branches is omitted in the case of such plants. The scale are, consequently, better than those produced by plants treated in the usual way. When the initial become quite yellow, which is the sign of full development, they are placked and the scale from these are taken out and are drued not in the direct heat of the sun but in the shade. These seeds are then used for sowige.

I have still to say a few words about the remaining important crop on these Malas lands, namely Shalu Jouar.

Shalu Jovar: —The varieties sown are Laharaki (स्ट्राप्य) and M. Mondi (साहरांद्र) or tiunds (स्ट्राप्य). The car-head in these cases is closely pucked and long, with large grains. The colour of the grains is very light yellow. The bread perpared from the flour of these grains is preferred by it, and the taste is peculiar, but pleasant. The outtime is heavy, nearly more than d while per acre that of an ordinary shalu field. This Krachar, Valley shalu is well-known and so it is mediess for me to further diple mon its importance.

Other crops that are taken in these Galacat fields are generally vegetables, which have been recently introduced with considerable succes. Such crops under onlineary circumstances would necessarily be irrigated in the lost seison. But the peculiarity of these lands is that for jation is away carried on. In the Karad and Rusgaon Talakas, a variety of vegetable crops are grown particularly just after the floods have subside. The land is ploughed and harrowed and then the following crops are taken: Potatoes, Cabbages, Badisles, Brinjals, Knoll-kol. Dinari & & &.

All these vegetable crops are grown jest as an ordinary cultivator grows but in connection with petato-cultivation one poculiar and import-

ant point may be noticed. My brothers—the Kanifkars have found out by actual experiment that if the potatoes are sown as soon as the waters have passed away then and then alone the crop yields a profit, otherwise it is a complete fulgre. If the sowing is even one month late, then the whole grop is spoiled and the jointness when day out are rotten. Before April the poratoes should be reajed, as after that time they quickly spoil. This Krishia Valley potato, as we may call it, differs in taste from the ordinary one. The taste is somewhat sweet but the positive and of potatoes are said to require test time for boding. Only the above vegetables are grown at present, but these seems scope for the increase in the variety of these crops.

### III. Dagda Lands:-

As I have said these lands are inferior to those termed Galizat and lence the variety of crops is also limited to a consulvible degree, in the Tasgaon Talula we find only Baja and Maize at the eighth row grown in these lands. But in all other places they invariably grownester and tobacco. As the tobacco of these lands is considered the best for chewing and smoking purposes some short notes on its cultivation may be found interesting.

Tobacco. The seeds are mixed with ash and are broadcasted on a separate seedhed in the month of Ashadha ( 27772). The endlings are ready for transplanting in the beginning of Sentember, the latest data bring at the end of September or beginning of October. The seedlings are tenneplanted when they are about three to four inches high, the distance between each plant and each row being thirty inches. After two or three days of transplanting a man goes in the early morning to fill up the gaps and at the same time pulls out those plants that are not well grown. Till the crop is matured many weetings and much intercaltacing is done, but I am not going deep in that subject here. This crop is allowed to stand in the field throughout the year. The outturn is nearly six handred seers per acre. Fome cultivators take a rotation crop from the cut stems of these plants. This is known in Marathi as सुदा समुद्धां. This rotation crop is not a profitable one. The outturn is about one third of the former, that is about two hundred seers, and the quality is inferior.

The tobacco on these lands is subject to several discases, when the plant is about four or five inches high. Then the leaves begin to

shrivel and contract and they do not broaden. This condition of the leaves is commonly called as \$\frac{1}{3450}\text{, Again}\$ after the seedlings are transplanted a black caterpillar attacks the plants. This caterpillar is known by the name of Hummi (\$\frac{1}{3400}\text{in}\$). Between two leaves this caterpillar builds with the ad of the plant, a small thick knob inside which the caterpillar leaves and slowly eats away the leaves. By this the further growth of the plant is prevented and the leaves begin to fall off. The preventive measures adopted by the cultivators in this case are as follows:—

- (1) When the cultivator comes to examine the plants in the morning he finds out knobs which are readily detected and cuts these with a khurapa and kills the cuterpillar inside.
- (2) A small area at the base of each plant is dug into which the caterpillar falls and can be caught. These caterpillars are collected and killed. This dugging of a put is done at the time when the cultivator see, that the leaves of the plant are drying.
- (3) The tobacco fields are kept quite clean. Any sort of weed is not allowed to grow between the plants or rows. It is found that by this method the attack of these caterpillars can be held in check.

# Our Konkan Staple Crop.

ВT

# M. N. Padwckar, B. Ag.

(Concluded from our last.)

In the case of rabi rice, the method slightly differs. Rabi rice is planted in the southern parts of the Itatangira district, and is known as Waigan Bhat. Waigan rice is an irrigated crop. Having harvested the lharif crop, water is let in the field and is stored there for a week or so, so that the stubbles get decayed, and wend seeds are destroyed. The soil also becomes soft and can be easily worked. The water is not required to be removed as it evaporates or is lost by percolation. Having ploughed the field a few baskets of cowding are spread in the field as a sort of manure. The quantity of cowding however is very small owing to the small number of cattle in this tract and secondly because of the transformation of cowdung into cakes for fuel. The urine. though of so much importance is never cared for. The field is then ploughed and well prepared for sowing the ced. If however cowdang manure be scanty, dear fish manure or any other cake manure is applied. If possible the soil is well prepared to secure fine soft surface condition. While these preparations are going on the seed paddy is being made ready for sowing. The seed padly, as mentioned before, is stored in a Mudi. The Mudi is then taken out, loosened and then kept on a hig stone or on a high place under the pressure of a stone, which does not allow the grass to blow away. Boiling water is then poured on the Madi followed by a few buckets of cold water twice or thrice a day. This is practised for two or three days, that is to say, until the seed germinates. The germinated see I is then carried over to the plot to be broadcasted.

In the even of the rice crop to be transplanted which forms by far the greater part of the crop, the seed is sown in the first fortnight of Jane. Silt lands are sown in the latter half of Jane. The Wargan rice is broadcasted generally in the latter half of October or in the first fortnight of November. By the end of November the fields are green with the rable crop.

When there is sufficient rainfull for transplanting and when the seedlings are about a foot high, the plot used as a seedbed is made wet.

so that the plants can be easily palled out. Generally four or five women are engaged in uprooting the seedlings required for transplanting one agre. The women finish the work hefore noon. At the same time the men are engaged in preparing a good mulchy soil by repeated ploughing. Water is let in the field so that it stands about ankle deep to knee deep in the field according to the convenience of the plot. The seedbed whence the seedings are removed is also ploughed and made ready for transplanting the seedlings. When the field is thus made muddy by so many ploughings and levelling, the secillings are taken over to a head land and transplantation is commenced. The uprooted seedlings are not smoiled even though they may be kept at home owing to some difficulty or objection for a day or two. Only they must be watered and kept in a cool place. The seedlings are transplanted by putting the bunches in the mad. The number of seedlings in a hunch as well as the distance between the bunches differs according to the nature of the soil. If the soil be rich, two or three seedlings in a lmach put in at a distance of about twelve to eighteen inches will thrive well producing a nich and laxuriant crop; but if the seil be poor and coarse it is considered necessary for the bunches to have about ton seedlings and the distince between the braches to he about six inches. After this transplantation which takes place in the month of July, care is taken not to allow the field to get dry for at least a month. In fact a good deal of water is kept in the field or otherwise the seedlings die out

The after entivation of the publy crop begins with September as in August the stagnant water checks the growth of weeds as well as the entrance of labourers. When weeds are seen, they must be immediately rooted out. One weeding in September is more than sufficient as later on the plants grow taller and stronger and do not allow the weeds any room to hold their heads up. Weeding operations are entrusted to women, the farmer enjoing a short rest or recess. The women start for the plcts early in the morning with bread and water for their meals of the day if the plcts los not far off; but if they be at a distance, they have to go there with the intention of strying there for some days. Hired labour at this season is very dear, if available at all.

In the month of September there is very little water in the field, and in certain soils, after weeding a second crop is sown at a time when heavy showers are not expected for n week or so. Such soils are

known as Dapiki soils—soils producing two crops. These secondary crops are generally pulses such as Tur (Pigeon pea) (Cajanus indicus), Pacta (Dolichos lablab) etc. The seeds are dibbled carefully so as net to injure the paldy crop, by digging holes about an inch deep by means of a stick or Loiti or a weeding hook. Tur requires a week or so for its germination but the other pulses germinate in two or three days. These secondary crops do not grow luxuriantly in the beginning but when the paddy crop is harvested, they flourish quite amazingly. The reason of this growth is practically the light and free aeration as well as the moisture in the soil, that the plants get.

Rice flewers in September. The early varieties put forth the inflorescence in the first half of September while the late varieties flower in the second half. At this stage they do not require any heavy showers. The female flowers are supposed to be fertilized at noon when showers are not at all required as they then are supposed to obstruct and check the fertilization, turning the heads barren. In the case of the raddy crop, watching of the crop while the grain is developing is not required as the glumes protect the seed from being attacked by birds etc. What little watching is necessary is in the case of waigan rice which is voraciously nttacked hy birds in the seedling stare.

The early varieties are ready to be harvested by the end of September and the late varieties are reaped by the end of October i. c., shortly hefore Diwali. The crop is harvested by reaping with a sorthe keeping the stubbles about two or three inches above the surface of the soil-If there be too much rain at the time of harvesting the crop or at a time when the crop is nearly ripe the produce is much affected owing to the falling down of the crop as well as owing to the separation of the seed from the heads. The Dewali holidays occur at this time and it is probable that the origin of this festival was due to the human nature in heing jolly and gay when there is pleaty of everything. In some parts where the puddy crop grows as high as about six feet owing to the abundance of water and moisture, they have to take off the heads some how but then the straw becomes poor in quality, and is only useful for thatching the roofs of houses. Really speaking the straw obtained from late varieties is useless for feeding the cattle. The straw of early varieties is used as folder, that of late varieties being used for thatching purposes. The average outturn of the paddy crop is about twenty maunds per acre, each maund of eighty pounds.

The subcrops grown along with rice such as Pauta ( Dolichos lablab), Tur ( Figeon pea ) etc., flower in February and are reaped in March or April, the yield per aere varying from two maunds to for maunds, each mann'd being equal to twelve Poona pailis. The outer hask of the seed is fed to cattle along with the green leaves but the plauts are used for rab purposes only. The busk and leaves fed to cattle increase the quantity of milk.

Having harvested the paldy crop in October, such of the soils as have no other crop growing or as have got sufficient moisture are ploughed and levelled after breaking the clods. This is however practised by predent cultivators. If the moisture be sufficient in the soil, they sow Kadua (Dolichos lablab), Mug (Greegram, Phaseolus mango), Udid (Phascolus mungo) and, very rarely, gram (Cicer arictinum). After sowing the seels are covered by levelling the plot. The crop is watered if irrigation be possible. Generally one weeding is more than sufficient for all the crops except gram which requires about three weedings. Generally gram is grown as a vegetable and not for seed. The crops are ready to be harvested by the middle of March. The creepers of the plants are fed to cattle. The yield per acre is about two to four maunds per acre as before but the cultivators prefer to sow Tur etc. as a subcrop as the expense incurred is much less. The sowing or rather the dibbling of the subcrops grown along with paidy is effected by women each woman daily dibbling seed sufficient for five gupthas.

The soils which have become tarren or which are such as do not hold water in the rains are also treated at this time. If it be found that even leguminous crops cannot be successfully grown, the soils are ploughed and exposed for drying. When the soil is dry it is collected by means of a peters or in some cases by baskets and removed elsewhere. The soil is removed in such a way as to produce so many pits which are the used for collecting water in them. The fields are kept fallow for one year at least. Later on the subsoil becomes the enrice soil and owing to flooding the soil temporare. La fact, the fertility of the soil is restored and the outturn is sail to go on increasing year after year for some time.

Insect pests: - There are a number of pests and diseases attacking the raddy crop in the Konkan. A few of the commonest ones are given below. Vit.—It is not positively known whether this is an insect pest or a fungoid disease. The ravages have been supposed to be due to some minute in-ects, which however have not been detected or seen by the enlithators. In this disease the leaves dry up. It is supposed that the disease occurs if the manner of led has been too great. Really speaking the disease has not been worked upon either practically or scientifically. Partical rely this disease uttacks the crops if the sky be cloudy.

Kid.—This is n stem borer of the palely crop. It is seen located in the stem which is mostly caten off and the crop has to be abundaned. No remedy is practised here. Akin to this in-cet there is another which cuts off the leaves but the damage done is not so severe.

Kukadya.—It has much to do with the serson. It often happens that after a good ruitfall showers become rare for a number of days, and the san shines brightly with seorebing heat. The water stored in the fields is hence heated and a good deal of injury is done to the crop. The stem gets burnt and the crop eventually dries up. Even though this is apparently the real cause, the cultivators attribute the damage to a herer.

Karpa.—This is similar to Kakadya. In the begining the crop flourishes well and is in good condition but later on it goes on drying. The disease has much to do with the water supply. It may also be caused by an excessive amount of momen as the effect is seen generally in fields situated round about the village. Naturally enough these soils get a heavy application of night soil arounds owing to their situation. The first showers, besides, carry offull the manurial dirt from the village and deposit it in the fields hard by. If the showers fail for a few days the crop is burnt and lost.

The crop has a few miner pasts such as rice hoppers, grasshoppers, insects belonging to the bug family, locusts etc. but the damage done by these insects is such as not to be taken into consideration by the cultivators.

Lexuriant lerfy growth:—As fatness is a disease in human beings so also laxuriant leafy growth is in crops. This leafy growth hinders the bearing quality of the crop and if not remedied the crop is lost. The only remedy is to ent off the grass-leafy growth-or to let in cattle to grave till the leafy growth is reduced to the normal stage of the crop. This mant be however done in time.

Varieties of Rice: -Tuning aside from diseases I may speak of varieties, of which I venture to present a list so fur as I have been able to ascertain in my own district.

Sarrent, Metad and some of the coarser varieties from the third class are grown on poor solls which may be coarse or even stony to a castain extent. Lowlying lunk usually grow Lanksmotor, Kanad and such other finer varieties. The lowlying lunks are generally fine in texture and get a layer of allowed deposit. Harbet is grown on highlying lanks. It may be grown on using soil on are comissions.

Awnel rodly is generally free from insect attacks.

Kharea Bhat and a few of the coaner and late varieties thrive well when the fields get flooded.

As regards the keeping qualities nothing definite can be said but it is a fact that if the paily is not carefully stored it is attacked by insects which cat the rice. The germinating power has not been experimented upon. The germinating power of all varieties keeps for over a year hat how long, cannot be definitely given.

If the statement be viewed for a time, it will be found that the finer the variety the greater the number of seeds per tola. It means that the grain is lighter and smaller. The varieties have got a number of sub-vancties, differing a size, quality and colour. This is perhapdae to soil and natural conditions of growth. An instance of selection may be given here. In some parts some fields produce pailty the grain of which is red in colour; the bodel rice prepared from these varieties appears as if muxed with blood but is otherwise an excellent rice. Even though a pearl white variety be sown in such a soil, in a few years the variety is sail to change and be transformed into a red and conveyance.

Many of the varieties will with difficulty be recognised by expert and practical farmers. Some of the varieties have a red hank but it is generally found that the relifer the hank the whiter is the polished grain. In fact nothing can be guessed from the outer appearance as to the quality of the rice except by expert and practical men.

Colours of some padly varieties are given below. The colours are mainly four.

- I. White coloured paddy varieties :-
  - Rajawel. 2. Patni. 3. Taosal (may differ in colonr).
     Waksal. 5. Shepa. 6. Panwel. 7. Malkudai.
     Kudai. 9. Sarwat hibasad.
- II. Flesh coloured paddy varieties :--
  - Warangal, 2. Kolamha. 3. Kothumbir. 4. Bar.
     Bhulas. 6. Harkel. 7. Sarwat (Sonpel).
- III. Red-colonred varieties are
  - Chimansal, 2. Tavsal. (both are longer). 3. Avachitan (grain rather flat). 4. Mahadi.
- IV. Spotted varieties are numerous but the principal one is Kharen bhat. This does not keep for a long time being attacked by insects.

I may add a short note regarding the special use of some of the varieties.

During marriages, feasts, heliday, festivals and ceremonial dinners, the varieties generally required for preparing boiled rice, sweet-scented rice, angar rice, spiced nice etc.—Salhar bhat, Keshari bhat etc.—are Rajaucel, Kamod, Kabutar and Ambenohor. These are fine varieties and stand in the first class. Besales they are naturally sweet and scented. They are not daily used as they are naturally sweet and scented. They are not daily used as they are naturally sweet and scented. They are not desired as they are naturally sweet and rather dear. The cultivation of these varieties is limited in this tract which mostly grows varieties of the second and third class. These first class varieties are not of daily use erea among the rich. The reason is that they are not easily digested and hence give rise to Dysentery. They require the addition of a large quantity of sagar, milk, ghee etc.

Some of the varieties are particularly used for preparing Pohe—an Indian preparation of paddy obtained by pressing the boiled rice, drying it, and then heating in an earthen pot called khapar. These varieties are so selected owing to their shape, size and flavour. Generally the grains that are long and flat as well as sweet scented or having any of the qualities are used. The varieties so used are:—

Kothimbir. 2. Jiragen. 3. Kabsal. 4. Tamsal. 5 Velehi.
 Kolamba. 7. Tavsal. 8. Chimansal. 9. Bagadi and other similar varieties appearing in the second class.

These are used for such Indian preparations as Modala, Kimparpolicic. They find a place on the rich man's table as boiled rice for daily consumption.

Bhudas, sarwat, and two or three other varieties form the best kind of bread. Shepa and Warangal are used by men of all communities for daily consumption, being suited and cheaper as well as tasty.

Rice is not tuned into spirit but there is one preparation called Anarass in Marathi which requires a sort of fermentation. The busked rice is kept in water for a day or two and completely dried. The rice is then ground into powder which tastes and smells acid. Gal (raw sugar) is then mixed in it and the mixture is made into circular cakes which are fried. What happens in the preparation of this sweetment cannot exactly be told.

There are, a few more varieties of puddy requiring the attention of metall men. There varieties are Somephal, Sarwat and Mahadi. These mee specially valuable for invalids, being the most harmless and easily digestable. They are used in venereal diseases as well. These varieties, strange to say, grow well in poor soils. Of these Somaphel is particularly used in cases where the patients suffer from poisoning, mostly reptile poisoning. Sarwat is generally useful but Mahadi is particularly of value in cases where the patients are suffering from wounds. Why they are so valued cannot be well ascertained by ordinary men.

Here I may give a short description of transforming paddy into the This transformation is effected in two ways—one is known as Surai and the other as Ukade rice. In the case of Surai rice the paddy is lightly crushed in special grinding mills, generally made of wood and known as Ghirat (Forg.). The other method—that of Ukade rice is that the paddy is put in boiling water till it cracks a little. It is then got out, the water is oxed out and the paddy is dried best in the shade. If it is dried to the san it is dried for a very short time. The paddy may now be turned into rice which is used for making Lanji or is trea fet to invaluke, after turning it into belied rice. In villages this is generally prepared by women of the family the touch of low caste women being supposed to polate the paddy. The rice prepared has a peculiar taste. After preparing rice, the busk is thrown off and is used

<sup>\*</sup> Sarwat is grown by broadcasting and requires comparatively little moisture.

for rabbing purposes, the husk known as kondu is fed to cattle which then yield a larger quantity of milk as they say.

There are a few varieties which are easily busked. They are, Shepa, Warangal, Kudai, Wassal, Taysal, Chimausal, and a few others.

Bhades and Harkel are used for extracting starch which when mixed with hime is much used for white washing. The starch is also used by washing and weivers to apply to the cloth.

The straw of the late varieties, as late already been stated, is useless for feeding purposes being course and tasteless. It is used simply for roofing the houses or for rab. The straw of early varieties is specially valued for feeding and is tasty and fine as well. It is much liked by the cattle of the Konkan, there being no hadhs or any other fedder crop with which to feed the cattle.

The average receipts and expenditure incurred in the cultivation of the pully crop are given below. They are roughly calculated to an acre.

Expenditure incurred in soils which produce only kharif paddy.

To thought and the same master I are the	1							
				$\mathbb{R}_5$ .	٨.	P.		
Rab charges.				15	0	0		
Kawal (entting of trees etc.)	4	0	0					
Cutting charges	1	0	U					
Kemal or grass.	5 1	0	0					
Cowdong.		8						
Carrying the cuttings on the farm. Spreading the cuttings, cowding.	U	8	0					
grass etc.	22	0	0					
Throwing cowdung, earth, water etc.	1	0	U					
	15	0	0					
Ploughing the rabbed plot.	10	٧	0	0	8	0		
Price of the seed puddy at 24 lbs. per re	ipeo.			1	8	0		
Ploughing charges of the field to be at 0-8-0 per ploughing (This inclu	tran	sol.	inted					
paration of the field i. e. working up	ho r	ในเก	100	5	n	0		
Uprooting the seedlings for transplanting	17.		,	ĭ	ŏ	ŏ		
Charges for transplanting the seedlings.	ъ.			î	2	ŏ		
Binding and making some such minor as	rang	tem	ent.	ī	õ	ŭ		
Weeding charges,		,		U	10	Ó		
Reaping the crop.				2	0	ō		
Guthering and conveying the reaped ground for separating the seed from t	Gathering and conveying the reaped crop on the							
separating it there as well as storing.	110 11	vaq	, ma	5	0	0		

Total expenditure ... 33 05

OF

Fawta 6

Gali (stubbles of the subcrop)

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Descripts of the models even
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Receipts of the paddy crop.						
Paddy grain at 33 lbs. per	enpee	50	to	7á	0	0
Fodder sheaves at 100 ,,	31		•••	7	0	0
•						
Tnt	al receipts	57	to	82	0	0

These receipts depend upon the season. Even if we take one khandi as the outturn per acre we get Rs. 57 i. e. there is a clear profit of Rs. 23-0. These are however calculated charges. We have not here taken into consideration the assessment which is about Rs. 5 as well as the castage charges. In fact if what the cultivators say be believed, they get a net profit of about Rs. 5 to Rs. 10 per acre, excluding the result they may to the owner of the land.

Let me now take the cultivation of the subsoil as well us the charges and receipts.

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Expenditure required in producing paddy crop ...
 Charges for getting seed . Tur at 3 pailis per
 Pawta (Dolichos lablab) at 4 paulis per rapes
 Dibbling the seed
                    •••
                             •••
 Harvesting the crop.
                                                 •••
                          Total expenditure Rs.
                                                      41
                                                      42
Outturn of paddy crop with sub crops.
  Paddy outturn with sheaves ...
                                               57 to 82 0 0
  Tur at 5 pails per rupeo
                                               18
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78 to 103 0 0

or

18

In soils growing these emberops they get a good deal of profit comparatively. The soils that grow ratio crops yield less, as compared with these soils as can be seen from the figures given below.—

Ploughing and preparing the soil for the rabi crop ... 2 4 0
Price of the seed (Mug) ... ... ... 1 8 0
Harvesting charges ... ... ... 6 0 0

· -- -- 60

Total expenditure Rs. ...

9 12

Outturn of Mug	***	•••		•••	***	16	Ū	Ű,
Guli (Stabbles etc.)	•••	•••	•••	***	•••	1	0	9

Total receipts of the rabi crop Rs... 17 6 0

The charges of the subcrop come to about Rs. 7 or 8 with an outturn of Rs. 2 but the rabi crop gives only Rs. 17 with on expenditure of about Rs. 10 and hence generally Tur or Pawta is grown as a subcrop.

From all these calculations it is quite clear that the cultivator is not much profited by growing a rab crop and the general tendency is to dibble Ter or Pawka as it can be existly sown while inspecting the plot. This is one of the reasons why the Koukan produces this Pawla crop so exteosirely. Besides it is easier to sow Pawla rather than Tur owing to the size of the seed.

It may however be meetioned here that the rice lands in the Konkan have practically no rules of rotation as such, the same soils growing rice year after year. This is due primarily to the poverty of the tract but the ultimate result is that after some years they have to leave the soil fallow for some time. Secondly the absence of the rotation system is doe to there being no saitable crop growing with the large amount of moisture present in the rainy season.

of lithough raddy rapictive rates of raddy and ries sold per rupe etc.

מוני היל אינה פסון חווו: (וחווגל זה פסום	Въмлике	11		(In the erro of early ratioties harvesting takes piece in the second fortugh of Celober). The west succe and ecented. It is very spaintly need there being no demand for the produce.		Sucet scented and fine varieties spatingly grown by rich cultivators for their use or for special reasons there being no demand.
	d ppronumate No. of seed per tola	2		136		1019
yerres,	Crop whether late or early.	0		Both	Late	용 .
addy varie				in ter	40 4	of of
Dect.	Barresting penod.	8		Second night Novem	1st fort- night of November	2nd fort- night of November.
irerent padd	Sowing period,	2 8		l'irst Second fort n'eck night in in June November.	do 1st fo night Novem	do 2nd fo night Noveu
ot different padd			3£ds.	18 Tirst Second in eck night in June Novemi	×	
names of different padd	Amount of seed re- quired per aces in Pouls ( 4 shers ) Approximate out- turn is manuls, turn is manuls, downing period,	2	Pails Mids.	Lirst n Jone in Jone	-8	,ê
ing the names of different padd	Amount of seeing for the force in Posts of seeing for the force in Posts of the force of the for	5 6 7	lbs. Pails	18 Tirst week in June	18 do	18 Ao
nt giving the names of different padd	Amount of seed re- quired per aces in Pouls ( 4 shers ) Approximate out- turn is manuls, turn is manuls, downing period,	0 4 5 6 7	Pails	25 13 0 19 First neck in June	6 18 do	\$1 90 90
Statement giving the names of different partity varience, muce or faury time reservoir.	sod formbace paddy and of the paddy and of the paddy of t	0 4 5 6 7	lbs. Pails	13 0 19 Ffret neck in Jone	13 6 18 do	14 6 18 do

grown on lowlying and rich soils getting solution and are solution of soils getting and are solution of solution are solutions are solution serves the numbers	of manufag.	They have got many sub-varieties which are both early and late.	This variety is extensively cultivated.	Do The area under this variety exceeds that under Kethmber.	Sweet and scented.	Sweet and fine.	Do
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ဗု ဗု	do both,	Ą	Late.	444	Larly.	qo	do
989	do fort- tht of ember.		of the				
	do Ist fort- night of November.	÷	2nd fort- night of November.	444	2nd fort- night of October.	qo	셤
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1, 28 14 65 19 do do 30 15 15 20 do do	15 7 20 do	17 8 20 <b>do</b>	18 10 20 do	10 10 22 do 15 10 10 10 10 10 10 10 10 10 10 10 10 10	18 9 20 1st week of	17 8 18 do	18 9 18 60

115

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Sevennent giving the names of different pandy varieties, rates of prady and rice sold per rapos exc.	Вгилька	11	Sweet but not fine.	Information not available, Sweet but not fine,	Do Taformation not available. Do Do	Information not available,
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paddy var	Perresting period.	•	2nd fort- night.	November. 2nd fort.	mgur, do do do do Dod week of November,	ę
erent	Boring period.	7	g g	44	50000	g
of dif	Approximate out- tenn in Mannes,	6	Md3. 18.5	18	15 46 17	
name	Amount of seed re- quired per acra in Pailts (4 shers).	127	Pailis 10 5	10 5	# \$\$\$	
ng the	Approximate weight of busked rice sold per rupee.	-	16g. 18	82	20 20 18	
nt givi	Approximate weight of unhusked paddy, sold per rupes,	6	12 Pe	88	8 558	
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### Cocoanut Plantation

# Western Portuguese India.

EY

#### S. P. Nazare

URING my short trip to the Portuguese territory of Goa during
March of the present year, I happened to sisit the coccanut
plantation of a friend of mine in the village Sanguilies.

As this is a very valuable and highly profitable plantation at the present time, owing to the rise in prices due to an increase in the demand for occanuts, I made a close examination of the methods adopted, and now beg to submit the result of my observations for the general benefit.

As a well known, the Portuguese territory of Western India lies below the western Ghats and bordering the Arabian sea. It has nearly seventy to one handred inches average rinfall, and its climate is hot and moist, identical with the tropies, the summer being rather trying as compared with that of Metallad or Mistal. As a result of these conditions, occount plantation is very widely undertaken and is the source of much pride to the people.

Many of the classes of roll which are found are reputed to be particularly fitted for the plantation of cocennats. The best are formed of Laterite rock of loose texture, are rough and course, and are mixed with a considerable amount of stad. They are of a pale yellowish colour and are well, easily and naturally drained. Such soils generally he along the banks of rivers that flow down from the Western slopes of the Glats. Here, also debrs and silt of manurial nature are particularly abundant, being brought down and deposited by them during their course from the slopes of surrounding hills.

For coconnut cultivation some among these are differentiated and preferred according to their physical properties, situation and productivity. The classes of soil are as follows:—

 Those that are entirely dependent upon the sweet water of the rivers or percenial streams in the inlands away from the sea.

- Soils that are on the banks of the sweet water rivers but also receive salt water from the sea which comes in during high tides.
- Those that are solely dependent un the salt water of the small channels or creeks from the sea.

In the first kind of soils the conditions are all good but occasionally salt is given as manure as it is a necessary plant food for the cocount tree. In the case of the second kind, no minute is required and these are considered to be the best of all soils, for it naturally receives salt water as a manure in a required moderate quantity during the high tides only. Therefore here the fatal effects of excess of salt are naturally avoided and proper plant food is also got in moderate quantity. In plantations on such soils, very little is spent for occasional mannes. Here the nilm thrives well and gives a good yield. In the third kin i of soil near the sait water, the palm recenes consulerable damage owner to once s of salt. It gives fruit in the fifth year of its life but its whole life is shortened to twenty five to thirty years, whereas in the second case it is prolonged to eighty years or oven more. The cause of this, -so it is said -is the following. As the roots of the palm habitually do not go deep but spread out widely, so when they reach salt water level the tree gets gradually weaker and constrictions are formed on the stem. Then for the stability of the pilin, supports made of lops of wood are placed at the sides to make it stand erect. In spite of this, however, it gets weaker and weaker and dies very soon for want of a proper quantity of plant food. This kind of soil is a contrast to the first, for, in the first kind of soil salt can be given as manure. But in this last case to supply the plant with the required quantity of good soil to withstand the poison is very difficult mill costly as such land is always washed, at intervals, by high tides.

In commencing a new plantition, holes are day three feet square and two and a quarter feet deep for one seeding and loose, frinble soil from other places is put into them. Four such holes are day in one day by one man, so the cost for each is one ama, the labour being compristively cheap. Some rich planters prefer to dig holes five feet square and four feet deep costing three and a half rapees each which is not within the reach of ordinary cultivators. But the palm in the latter case is sure to give a very high yield and that too before sixth year, for it gets the maximum space for the extension of its roots. Then the distance kept between rows in I plants is trentificant feet.

In these holes the seedlings which are grown by special professional growers are put one in each. Any mru can grow these seedlings but they become inferior to those grown in a particular village i.e., Bandawalim in the Portaguese territory. For here they are well selected and grown in particularly good study soil. In addition the plumule is fostered carefully and grown twee than the rulicle. Elsewhere the radicle grows faster and lurger than the plumule, which is considered an inferior condition of things. The co-t of each seedling is two and a half anness at present.

This planting is done in the mouth of April and each plant is waterel every morning and evening into the setting in of rules, i.e., for a mouth of two. Damp the rainy execu, in any case, it gets sufficient water. Then in the mouth of October a ring surrounding the plant is dug and ordinary wood ashes is put in it and watering is given only on attenute days, for about three years more. The newly planted plants were either two feet high (which I was told were one year old plants) or four and a half feet high, which I was told were one year old plants) or four and a half feet high, which I was told are given as required every year, which costs four annua per year per pulm including one in the loosening of the surrounding soil.

Then in the fifth year be is of both five feet square are propored so as to hold nearly four palms. The racent parts in them are occasionally ploughed lightly to crudicate weeds, to hold the minure washed away by the runs and to conserve mosture.

Manares as they use generally are four in number.

First. Fish manure is best but the best planters do not give it; for, by its application the plant is said to be exhausted quickly in spate of its good yield for some few years. So the majority rather tend to avoid fish manners.

Second. Simple sait is given every fourth year after the fifth year from commencement at the rate of twelve seers per plam, the cost being one ann. During the first five years sait is given at the rate of from one eighth of a seer upto one seer by a gradual increase to prevent destruction from white ans.

Third. In salty lands ashes are given every year in the month of November and December to ensure, so it is thought, the full development of the maximum number of fruits on the stalk. Fourth. Heated soil is also given to plams and this has proved the best, at least on the plantation that I personally waw. It costs very little and is done in the following way.

First the soil is day according to the quantity required and spread evenly on the ground two inches deep and over it wood loppings and dried branches are put and over that again a thia layer of soil of better character, less than two inches thick, is put, and the, woody central part is set on fire. When this is all burnt and slowly set down, the heated mixture is, after cooling, put around the lase of the plam, three or four baskets being applied to each one, care being taken not to expose the expanse of roots. If instead of wood loppings, cocounit fibres half dried and buff fresh are put, it is said to be an excellent manner giving the best yield.

The average cost per plain from the beginning upto its fruiting in the sixth or seventh year is not more than one rapse. After this time, for each year a single pulm demands for althyation, minure, and other for each year a single pulm demands for althyation, minure, and other operations, an expense not greater than four unias. Such a pulm, well carel for, gives nuts worth five rapses at the least while the yield may, at a miximum be worth ten rapses. There are four cuttings in the year provided peets and discuses are absent. The ordinary yield of a pulm is about eighty nuts and maximum may go upto one hundred or even one hundred and fifty. So a angle pulm does not require a greater expense than twenty rapses as the total during the whole of its average life of sixty to seventy years. In some examples I have heard that grandions are taking the outture of the crop that was planted by their grandiants taking neither any trouble nor planting any new trees.

Considering these facts, it seems to me that I must not conclude without suggesting that here her a good field for those who would go in for farming on their own account.

### Cultivation of Bamboo in Assam.

# Naresh C. Das.

MIBO3 is an extremely valuable crop from a commercial point of view, and it can be grown with a comparatively small amount of expense and care, provided the conditions are favourable. A garden of an acre may give annually an income of something like two hundrel rupees nine or ten years after being planted, and, may continue yielding for forty to fifty years.

A light allinvival loam is best a lapted for the cultivation of bamboo.

In the the district from which I come,—the Goelpara District of the Province of Assum, there are many varieties of hambon, solid or hollow, thick or thin, strong or brittle, large or small. Only those varieties which are of good quality, much esteemed and used, and, which have a large demand, in the locality in which they are to be planted, should be grown.

The bamboo is almost always propagated by sinckers, as most of the varieties rarely flower. But there is one "kind of familion in Assam which bears fruit and can be propagated by it. This variety is small, bollow, thin, and is cheefly used for constructing fences or screens. The fruits use of about the size of a small guara and the slape is almost like the boll of cotton (Waghad variety), the lower end being acute and a little bit bending and the colour dark green. Recently a fruit which I brought from Assam, and which had a beautiful sprout on, though it was a bittle bit injured owing to my long pourney, was given to the Leonomic Dotanist of Bomlay to grow.

Method of Cultivation:—In the month of Ealshakh, at the beginmind of the monsoon, holes are dug twenty feet apart, the depth of
each hole being such as to cover the root and nine inches of the stem of
the tambor to be planted. Cowdong minure is put into the holes, and
they are left in this position for a time. Then in the next month when
the soil is safficiently moist and soft, hamboos are planted. The cultum
for planting must be selected from those of the latest generation, those
of the older generations having scarcely any suckers on them which can
give rise to a new plunt. Each cultum must be dog out with the roots

<sup>·</sup> Melocama Lambutoules

care being taken not to injure, in any way, the hads that may be on them. In Assam the top portion of the culm leaving a yard or two below is ent off. The hamboo is then put shutingly into the pit and is covered over with earth. In the dry season, if the soil is not moist enough, watering should be practised in the first year of its growth only. But in Assam where thre is plenty of rain throughout all the year, watering is not practised and there is no need for it

In Assum the humbor is grown on the bonder line of the garden or Bari. The border line is raised by earth excavated just outside and close to it and humbor is planted on this rused line of earth provincially known as "Pagai." In Bengul a separate plot of land is specially kept solely for its calification

After treatment:—From the year after the plunting of the bumboo sit or ask should be given every year in the mouth of Baishalt. If these cannot be obtuned, fresh earth will do to a certain extent. This practice favoures the vigorous growth of the clump of bamboos. In Assum old, notion straw, taken out from the roofs of the houses, is also upplied to the clump when the hamboos are beginning to give fresh spronts.

Another very successful treatment often given to the hambon plantation with favourable result is to apply rice "Bhusa" or Chita or Patan as it is called in vernacular. This practice especially strengthens the clump and makes it more durable.

But beyond all these methods of treatment, which all in their own way are good, and, rarely fail to produce the desired effects, there is one, which can be recommended to the grudeners, in connection with bringing about the luxuriant and healthy growth of the bamboos. This is to set fire to the whole clump at its root in the mouth of "Falgeon" when there will be no new sucker coming out, and, then to apply earth to the clump in the next month. In the wild bamboo forests of Assam which are hurnt every year at this time, nature thus assisted, most vividly holds before the wendering eye of man the utility of this practice.

Cutting of cutms:—In cutting the culms care should be taken not to cut over much. For the first years of its growth no cutting should be made at all, or it is sure to interfere with the steady and vigorous growth of the clump. From the fifth year at most four rips culms may be allowed to be cut. But, nevertheless, the lower the number of cuttings the better. Then gradually the number may be increased. From a properly treated bumboo clump annually ten to twelve culms may be cut. Care should be taken to cut only the ripe ones and not the young ones which have growing buds on them, which suffer the most in consequence of the mother bumboos being cut off. No cutting should be allowed at the time when the new suckers are appearing or the people cugaged in the job, may tread on the soft tops of the suckers and mires them.

Diseases and Pests of Bambos:—Only one disease I know of, and, that interferes with the length and quality of the culim. This is the untimely rotting of the tops of the young suckers, when a few feet high. This disease is commonly prevalent in Assam and is known as "Ag Mogha." The clumps attacked by this disease are very short, take a long time to tipen and are not fit to be utilised in any good and durable purposes. This disease may however be averted by according to them proper care and treatment such as has been described.

The useet pest, to which a large number of culms are liable, is the back ant. There are some binds and squirrels, that naturally prey upon their caterpillurs, living inside the stems. They cut large loles into the stems and take them out and eat. Sometimes men use the caterpillar basts for fish. But the remedy serves to aggravate the maldy. The binds and squireds will spoil a large number of culms in search of their food. But it is needless to say that they do lessen their number, which would otherwise have been too numerous to check

# ✓Improvement of Khandesh Cottons.

#### BY

#### K. D. Kulkarni,

#### Cotton Supervisor, Northern Division.

THEN we first commenced our experiments in the improvement the first thing which became evident was that Khudesh cotton was a muture of five types, having a differently coloured flowers and differently lobed leaves. This fact of a recognised commenced cotton being a muxture is not peculiar to Khandesh cotton, the same is found, for instance in the Korkih cotton from the Nizam's Domituous.

It was quickly found that these different types give a different quality of fibre, a varying ginning percentage of lint to seed cotton while they also differ in yield per acre. The types were separated from one another in 1905-99 by marking out each kind of plant, and picking cotton of each plant separately into five prominent groups as below:

Botanical name. Local name. Characters.

Neglectium rosea ... Varadi ... White flowered...Narrow lobed.

Neglectium vera katha

Neglectium vera katha

varensis ... do. ... do. ...Broad lobed. Neglectum vera malvensis. do. ... do. ...Medjum lobed.

These have now been grown separately for the last five years and the gunning percentages and yields which they have given are shown selow. Each variety is indicated by the initials of its botanical name.

Variety. Ginning percentage. Yield per acre. 1906 1907 1908 1909 191 ) 1909 1910 N. R. 35.7 32.1 37.6 37.6 37.4 870 14624 N. R. C. 35.7 31.9 35 .... 26.3 750 12003 X. V. 31.6 24.6 29.1 25.9 27.1729 5921 N. V. K. 28.5 21 27.7 27.1 23 741 380 N. V. M. verv small 23.3 26.1 25.1 656 593 quantity.

Before the year 1999, as only a few lines were being grown of these types, the yield is not given.

The net profit which we have got by growing "Neglectum rose," or the narrow lobel variety of Vanadi, on a larger scale instead of the other less profitable types is as below:

	1909.	1910	
	its.	•••	Rs.
Extra yield of "N. R." in comparison with "N. V."	141	•••	570
Extra yield of " N. R." in comperison with "N.R.C."	' 00	•••	253
Increase of profit per acre of 'N.R.' over 'N.V.' owing			
to extra yield	20		124
Increase of profit per acre of "N.R." over "N.R.C."			
owing to extra yield		•••	36
Increase of profit per acre of 'N. R.' over 'N. V.' owing			
to better guining percentage	20	•••	5l
Increase of profit per acre of 'N. R.' over 'N. R. C'			
owing to higher giming percentage	6	***	51
Increase of profit per acre of 'N. V.' over 'N. R.' owing	1		
to better quality	5}	***	4

Thus it is clear that the total profit from an acro due to growing N. R., after deducting the loss in quality in comparison with N. V. in 1909 is its, 40, 12 as, while in 1919 it is its, 171, while in compution with N. R. C. in 1909 the increase is Rs. 19 and in 1910 Rs. 41-8 as, taking 270 Rs. per klundi (784 lbs.) for paradi luit and 290 Rs. per klundi for Jari, according to pre-ent market prices. From the list year's results as to the mixture of Khandesh cottons in different talukas, we can say on an average that it consists nearly 3 of N. R. § of N. N. C. and § of N. V. M. and N. V. K. types and hence the utilizators who have taken the sect from us, got an additional profit per acro of Rs. 20 in 1909 and Rs. 70 in 1910, by growing the pure type only.

Owing to these enormous profits, the demand of this pure type is increasing by leaps and bounds and this depritment will not be able to cope with it. In feet it will probably be necessary for cotton growers to increase their own supply by taking from us seed sufficient for an aree. If this be cultivated crufully next year each of them will be able to sow his whole are with this pare variety. As for keeping, the seed pure, this does not present great difficulty as small hand-gins will gen seed sufficient for each small cultivator's purpose, and larger growers can jet their seed cotton ginned separately in a power gin.

There is moreover a considerable field for enterprise, in increasing the pure seed on a commercial scale, for our seed this year was bought at Rs. 1-S-0 per manud when onlinary cotton was only bringing Re. 1 per ranged.

In Khandesh several Marvaris do gin the local cotton on bandgins to self for seed purposes and people pay a little higher rate for thi hand ginned seed. If the N.R. variety be kept pure and ginnel separately there will be certainly a considerable demand for it for some years until enlitivators generally have got this seed, after that time, it the method of pucketing out the first two pickings out of the cotton o the best fields and ginning it separately be continued, this selectes seed will give still better results in yield year after year.

There is one other question in connection with the improvement of Khandesh cottons to which I wish to refer. The methol of taking cotton crops on the same land year riter year, or even for two years it succession is injurious both for yield, quality of seed and becomes a mean of spreading cotton diseases. Of course, many cultivators in Khandesl take Jowar, Bajri and Til, in rotation, but few have come to any decision us to which out of these three is the hest. From my experience on the Dhulis furm Til is the best rotation and it also enriches the soil by its dropped leaves and flowers. The cotton crop also gives a bette yield and appearance in the following year. Between jowar and bajr in a rotation with cotton, the latter is better, because jowar seems to be a more exhausting crop than bajri.

#### Observations on Village Cattle.

ΒY

#### F. Gracias, G. B. V. C.

Demonstrator in Veterinary Science,

\$77.71AAT is the actual condition, in a normal season, of the cattle in the state of the cattle in the c

The searon 1910-11 was a good one,—rather better than anomal, and, therefore, when the study was commenced in May 1911, the cattle were probably in rather better than average condition. The villages selected were within a few miles from Poors, and were easily accessible by hiercle. This fact will perhaps affect the results, but allowance can be made for this. The villages were Aundh, Dhapuri, and Bhopuri and it is believed that practically all the village cuttle were evamined during my several visits.

On the whole, the animals were in fairly good condition better than I anticipated. The cows were worse than the working oxen, and there is evidently a tendency to feed the latter better than the cows and calves,—the latter again being largely neglected, and fed with a little hay at the most, except when in milk. Beyond this they are expected to pack up what they can.

All except the working cattle are usually let loose to graze in the moring on pustures that have hardly any folder on them during tha dry or hot mouths. They return home in the evening almost as hungry as they went out, perhaps worse, and are tied either in bailly ventilated sheds or are left to themselves in tha open air. The most they are given is a few pounds of hy which the animals deven greedily. Milch cows however are given some grain and a little more fodder. The yield of milk is consequently poor and the owner draws out nearly all the milk he can get, leaving lettle or nothing for the calf.

Working oxen on the other hand are cared for very well. They not only well housed but are given a good quantity of fodder, washed and groomed every second or third day and any little thing which is wrong with them is promptly attended to.

Nearly all the animals in these villages are Decean; only one Surti cow belonging to a Dhapari cultivator, in excellent condition and yielding a year fair quantity of milk came under my notice.

There is no system of breeding animals, all of them, as I have said before, are let out to graze, and in consequence a really very good cow may be covered by a worthless hall. I have not come across in the three villages a single ball which I could call decent for breeding purposes. The breeds found in these districts are the Deceant, Midvi and Khillari. Malvi and Khillari animals are meetly working exen and are therefore seen in gool condition. A few mixed Malvi cows I have come across during my visit. If only the people could be persunded to improve this stock by gotting their animals mated by good stad-bulls, I have no doubt the Deceam breed would be a very good animal for this part of the country. Besides the Sarti covers one Gajunt at Kankrej ballock belonging to a tell (person who extracts oil from seed) was seen pulling the oil-extracting machine.

The Decemi breed serves the purposes of the agriculturist heautifully. It is a very good, strong enduring annual, having mostly short thick pasterns, good strong back, well set neck, aregularly shaped horns and an intelligent face.

So far no contagions disease was discovered among the rattle of the above mentioned villages. Foot and mouth disease was maring in these villages a few mouths before but at this visit I saw no russ. It is a highly contagions disease, attacking in fact in a comple of days all the animals of a village. It is mild however and very few unimals even either succumb or are thoroughly disabled. The appended table shows the sex, disease and health of the animals of the throw villages. Animals under the heading "dobility" are those that are extremely week; those that were suffering from the diseases marked against them were freated there as no coaving or any inducement in fact, would convince the people that treatment in hospital would be very much better and safer; although they seemed to be satisfied with the treatment, they do not care for hospitals. They promised most faithfully to bring all sick animals, but I fear it was a more blaff as no ani-

mals have since then been brought with the exception of two or three marturition cases. Such cases are first of all handled roughly by inexperionced people of the Ganla caste; they destroy erecything they get hold of in their manipulation and when the animal is thoroughly exhausted and on the point of death, they burnfelly cart her to the bordial: they then expect us to relieve the poor creature which in most cases is impresible.

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	e results may	le sur	mari-:	l 23 folls	সের:		
Aundh.							
To	ral Number.					251	
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	(2) Oxe	a	,			97	
	(3) Cm	r				89	
	(4) Cali	T&	•••••	·····	•••••	12	
	(5) Euf	ale Ea	lts			0	
	(6) lins	alo Co	F5	·····		35	
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Aurdh.							
1	Hæmsturs	***	•••	•••	1	***	
2	Hoven	•••	•••	•••	1	•••	***
3	Conjuntivate	• •••	***	***	1	***	***
4	Optlalmia		***	***	***	2	•••
5	Adicomyor	·s	***	1	•••	1	***
G	Hernia	•••	***	•••		1	
7	Scarly neck	•••		i	5		***
- 5	Euras				***	***	1
9	Sjrah		***	***	1		•••
19	Temour				2	•••	
11	Ab-ceu				3		
12	Dekildy			1	1	29	
Blops	ri.					112	
T	tal Number.						
	(I) E <sub>2</sub> D	Ŀ				5	
	(4) Ox-	p				25	
	(3) Con	T				57	

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#### Observations on Village Cattle.

Diseases.			Bull,	Oxen.	Cows.	Calves.	
Bhopus	ri.						
1	Scurfy neck	***	1	4	•••	***	
2	Abscess	•••	•••	1	•••	***	
3	Debility	***	1	2	7	2	
Dhapu	ri.						
To	tal Number.				100		
	(1) Bull	8			10		
	(2) Oxe	n			51		
	(3) Cow	3			23		
	(4) Calv	es		•••••	1		
	(6) Buff	alo Bulls	•••••	• • • • • • • • • • • • • • • • • • • •	0		
	(6) Buff	alo Cowa			15		
	Diseases.	Ball.	Oxen.	Cowe.	Calves.		
Dhapuri.							
1	Actinomyco:	is	1	1	***	***	
2	Sprain	***	•••	1	***	•••	
3	Abscess	***	1	2	•••	***	
4	Tumour	***	•••	3	•••	***	
5		***	***	2	•••	•••	
6	Debility	•••	1	7	1	***	

# College News and Notes.

We are almost at the close of a season which, to us, who have made agriculture our life, is either the smiling harbinger of a luxuriant harvest and well-stocked barns, or the precursor of disaster and distress. The time we have passed through, during the past quarter, has been one of ever recurring doubt and uncertainty. During the long spell of dry weather, almost throughout the month of July, we felt the silent pleading of our thirsting crops for water, for rain. It grieved us to be able to do nothing for these parched emphiants save watch and wait. And we watched till the heavens sent down the welcome showers which came in ponring torrents in Angust to lighten our auxieties and to give our plants the rain which no resources on our part could obtain for them. But while our fields in the Deccan and the Koukan have been kept from absolute want, it is sad to think of the ecarcity prevailing in other parts of our Presidency, where the heart-rending cry for rain is day after day mournfully augumenting. With kind sympathy, we join those who are waiting, "sad, dejected, weary, waiting" for the rain and make our humble suit to heaven that we be mercifully spared from the scourge that is threateningly knocking at our doors.

To turn to topics more cheerful, of all events eince our last issue, the opening of the new College buildings by H. E. Sir George Clarke was the most eventful. The date fixed for the occasion was July 18th, a day happily coinciding with that of the incorporation of the University of Bombay, fifty four years ago; and undoubtedly, it must have heen a day of joy and gladness and hope for the streamons and pioneer workers in the cause of improved scientific agricultural education in the Bombay Presidency.

There could have been nothing so gay and yet, so imposing in its simplicity as the aspect of the College buildings and grounds on the occasion. As announced previously, preparations were being builty made and hundreds of hands could be seen towards the week, prior to the opening, husy at work giving the final touches to and brushing up the college for its christening. Invitations were very largely issued and

the generons response to them could be seen in the large assembly of ladies and gentlemen that filled the spacious and beautifully simple hall—beautified for the occasion with nature's best ornaments—to witness the unveiling of this endaring monument to scientific agriculture in the Presidency—the denoument, we may well say, to the unwearying exertions of our principal, Dr. Mann.

H. E. accompanied by Lady Clarko arrived at the College at 5 p.m. and the proceedings were immediately opened by a speech by Dr. Mann. His Excellency also, before cutting the cord, spoke at great length. We have the pleasure of reproducing the speeches in a separate article, as they are brumming with interest and bespeak the zeal of H. E. as well as Dr. Mann for the promotion of agricultare.

The opening ceremony being over, the grounds and huildings were left at the disposal of the guests for inspection. There was a miniature exhibition and several interesting demonstrations in the subjects taught in the College were given. Neat little brochness containing a short history of the College and photographs of the haldings and professors were distributed as sourceirs of the occasion.

We all congratulate Dr. Mann most heartily, for his success in the regeneration of scientific agriculture in our Presidency and in rapidly raising hy his antiring exertions the College halldargs for the purpose of giving the youths in the Presidency as therough a training in agriculture, as possible. Well may be be proud of this great achievement and right deserving is he of the thanks of all interested in this science. While congratulating Dr. Mann, we, the students, trust to do our best to gain a worthy name for the institution and pray that with increasing years it may flourish more und more and become the finest institution of its kind in India.

That there were many who evinced a great interest in the exhibition on the opening day was seen in the correspondence appearing in the local daily requesting that the show might be held again to enable the visitors to make a more minute study. Dr. Mann very gladly responded to this request and on July 31st, the college was again open to the public. A very interesting lecture was also delivered by Mr. Barns on the "Treatment of mango Plantation." H. H. the Chief of Ichal-

karanji was in the chair and a large gathering filled the college half.

The lecture was given under the puspices of the Deccau Agricultural

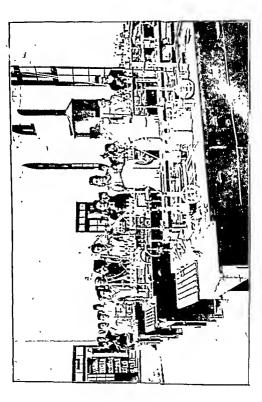
Association.

The excellent ordering of the College leaves, we believe, nothing for the students to wish for except that the wint of lavatories—which is n sore want indeed—be supplied as soon as possible. The daily stretch of five or six long hours in the lecture rooms makes the absence of these essentially felt and we would wish very nuch the P. W. D. would hasten to put an end to this disconnect.

The dispersion of the residential etudents in various places is also another trouble. Some are living on the farm, others near the Vetennary benythal and others again near the Bort Club. It would be long to enumerate the inconveniences and difficulties caused thereby, but one thing we fear this dispersion tends to isolate the members of the different messes. We trust that before long we shall be all happily living under the one benign roof of the hostel on the college grounds. It is much to be regretted that the hostel was not ready to be opened along with the other buildings last we may console curselves that there is every chance of our having a heliday in the near faster to celebrate right colemnly the inauguration of our new and permanent future residence.

We now betake ourselves to the pleasant task of wishing all our fellow students a pleasant and prosperous time during the second term. They have, we trust, refreshed themselves during the venction,—some of them at their homes, others in the genial company of their friends at the quarters—after the hard and anxious days of the first term and are prepared carnestly to undertake the harder work now before them.

The college will again shortly wear the quiet aspect of the vacation as the "B. Ag." and "F. Ag." students will be leaving Poons on their agricultural and geological tours. The "S. Ag." students will be left all forlors and will have to busy themselves with surveying and levelling. We tender our heartly wishes to all to the "B. Ag." and "F. Ag." that they may bave very interesting and instructive days on their trips and return very learned and wise to fill our next number with



the notes of all they have seen and done and heard, the "S. Ags." that they make a correct survey and even attempt to outlothe Engineering students in their drawings.

We note with pleasure that the nest year students are this year doing a good deal of field work. They have been allotted small place ground and are being practically mithated into the mysteries of the farm work that will full to their bot in the S. 1g. class. We should expect to hear of excellent results this very in the F. Ag. examination in practical agriculture as the present student, have a decided advantage over those who have after it clumbed that rong in the ladder of agricultural progress.

The second year men had several outrass, for the practical study of entomology and plant cology, to the Ganeshkimi and Empress Gardens. They also paid a visit to the Manjir Farm to see the sugar-cane growing there, and the manufacture of gal.

The date of the Social Gathering has been fixed this year for the 3rd of Norember. The day was chosen after deep deliberation by the general body of staff and sindents who met together to decide the matter. The date in November was selected as the cause in October last year prevented the sports being field on the day of the gathering. We hope that unanimous co-operation will enable us to make the occasion very enjoyable one to all.

We again have to offer our sincere congraintations to Dr. Mann on his being elected a syndic of the University of Bombay, President of the science Association of Bombay, a member of the advisory council of the Guild of Science in England and examiner for the enving M. A. examination. It does indeed make our hearts glad to see this increasing public recognition of the work and abilities of Dr. Mann.

We regret however that our joy has been marred by the very ead news we received a few days before the closing of the last term, of the death of Dr. Mann's mother. The news must surely have come to him as a severe blow. Although we have not had the happiness of being acquainted with her we doubt not she was a lady gifted with virtnes fair, since they are so admirably reflected in her son Dr. Hayold Mann. We are sure the loss is keenly felt by Dr. Mann as he could not be by his mother's dying bed, but it must be a great consolation to him that he was able to see her at home quite recently. We ofter Dr. Mann our kind and heartfelt sympathy and trust that time, the healer of all wounds, will calm his sorrow and heal this deep wound which heaven has been pleased to inflict on him.

The stadents of the college who were much affected by this sad news assembled in a meeting on August 39, and resolved that a letter of condolence be cent to Dr. Mann, expressing the grief and sympathy of all the students in his bereavement.

We hear with pleasure of the appointment of Mr. G. D. Metha, B. A., B.Ag., in the Imperial Agricultural Service. An account of his brilliant career has already appeared in our pages and his new appointment is assuredly well deserved. We give him our best congratulations, and wishes for n bright and prosperons fature.

Mr. B. B. Price who was the senior assistant in the chemical laboratory has been transferred to Dacca, in charge of the laboratory there. Mr. V. A. Tamhane, I. Ag., has been appointed in his place here.

Mr. G. K. Kelkar, B. Ag., has been transferred from Maujri Farm to the Central Provinces. We have now several representatives in the agricultural service in those provinces, and we hope that they will continually remember their alma mater and seek continually to do her credit.

Messrs. V. G. Patwardbau, B. Ag., and D. D. Abhyankar, B. Ag., have joined the chemical laboratory staff, while Mr. S. R. Paranjnye, B. Ag., the former manager of this magazine has also done so in a temporary capacity.

## College Gymkhana.

The season we have gone through has been very lively for the several cricket and hocker matches that were played. We are glad we were able to get up a team for cricket composed of some of our veterans and also some freshmen like Lalkaka, Bhandarkar and others. We regret however that we had not the pleasure of coming off best in may of the matches; this argues very much for better and longer practice in cricket than we now obtain.

We had again this year to play the college of Science for the shield competition. Our team going in first score a paltry 44, Bhadkamkar and Lalkaka playing a steady game and scoring fairly well. Our opponents responded with 102 runs. Our men started the second innings well but could not put in more than 75 runs. The College of Science had thus only 17 runs to beat us which they scored without the loss of any wicket. Mr. Deshpande did yeomen service in his wicket keeping and in playing a very good game of 25 runs in the second innings. Comparing the strength of the teams we may well say that we came off quite as well as we expected.

We congratulate the Fergusson College for their success in winning the shield this year. They wen both the rounds in Poona against the Deccan and Science Colleges, and also the final round in Bombay against the St. Navier's College.

Hockey is making headway among the games at the College this year, and many have taken very enthasiastically to it. A very good team has been formed among whom we have some fine players as. Regi D'Souza, Ialkaka, the Masani brothers, Rebello and several others. Mr. Burns has been adding to the spirit of the game by playing in several of the matches. We are glad we are able to record one victory against the Police team. The last match of the first term was played against the Deccan College and though it was lost, our team played an excellent game indeed, and showed itself to have improved very much with a couple of months' practice.

The Secretary for Tennis has nothing particular to report. Many of the enthusiasts in Tennis are living far away from the court and hence there is not very much of active life. The tournament will commence shortly and we hope to see a large number of entries, good play and a healthy competition for the coveted medals to be presented on the day of the Social Gathering.

The Gymnasium is making steady progress and is well appreciated by the Kirkee Lodgers in particular.

We have had a series of lectures in connection with the Agricultural Association but the interest in this secrety seems to be somewhat flagging. The attendance at many of the lectures Liss been very disappointing and seems rather na recommandle. We hope to see the old zeal for the association revived during the second term particularly as the time and labour speak by the lecturers in working out their papers requires our hearty appreciation.

Dr. Mann opened the session by a brilliant imangaral address on the Iafa and Work of Pasteur. Other lectures of interest were "Poultry Industry" by Mr. Knight, "My last summer Tour" by Rao Saheb G. K. Kelkar, "Betel Nut Cultivation in Assam" by Mr. Das and "Tanning" by Mr. Padhye.

The programme for the second term is:-

Improvement of Indian cattle ... ... Mr. C. V. Sane, B. Ag.
Grape Culture ... ... ... ... ... Prof. Burns, B. Sc.
Ginger Cultivation near Gandevi (Sorat Dut.) Mr. R. K. Desai.
Voung India and Agriculture ... ... Mr. V. R. Gadgul.
England's best act towards humanity ... Mr. R. A. Isilhada.
Manurial resources of the Bombay Fress- Mr. V. G. Gokhale.,
dency and how they can be best othized. L. Ag.

## NOTICE

# THE FOURTH SOCIAL GATHERING

0F

# THE POONT AGRICULTURAL COLLEGE

Comes on Friday the 3rd November 1911. All past and present students and those interested in the College are cordially invited to attend.

V. N. GOKHALE,

Hony. Gen. Secretary,
The Fourth Social Gatheriug.

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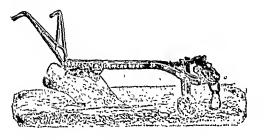
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THE

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#### POONA:

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Vishnu Narayan Gokhale.

1912.

#### POONA AGRICULTURAL COLLEGE MAGAZINE.

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.Members.

Mn. B. B Josni.

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#### Notice to Contributors.

The Magazine is at the disposal of Professors, 13st and present students as well as outsiders having special interest in agriculture. All contributions should be wilten legally and on one sale of the paper and are subject to such needful emendations as may to consistent with their ideas and rejected articles will not be returned

The Magazine will be published as follows -1st July, 1st October, 1st Junnery, let March and contributors are requested to send in their contributions at least one month before the state of pullication,

B S PATEL I'ditor.

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# POONA AGRICULTURAL COLLEGE MAGAZINE



#### POONA:

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Ву

Vishnu Narayan Gokhale.

1912.

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Dr. H. H. Mann, Principal Agricultural College, Poona.

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- The model seed drill should be a full alzed one suitable for working in the fields,

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- The models of drills will be received by the Principal Agricultural College, Poons, to the end of May 1912. In case drills of similar pattern arreceived from more than one person preference will be given to the one that is first received.

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Director of Agriculture, Loubey Presidency.

# The Poona Agricultural College Magazine.

#### Editorial.

ANTHEN the last number of the Poons Agricultural College Magazine was resued, famine over n very large part of Western India seemed to be imminent. We regret to say that what was then a prospect which might be avoided has now become a very serious reality. Northern Gmerat has had no rehof: rain has been almost completely absent: fodder is almost non-existent and hence cattle are suffering seriously: these are signs of an imminent water famine,-and, though we trust there will be no deaths of men and women from starvation, set it will be a terrible time of suffering and difficulty during the coming months. In the Southern Maratha country, the conditions are better. There were rains in the early part of October. These will have seemed some sort of crop, though we few only a small one. The Decean is much worse off, and the condition is only u stago less serious than in upper Gujarat. Fairly general light min at the end of November has put off the horrors of a fedder famine, -but the relief is, we fear, only temporary.

This failure of the rains,—the third almost complete failure in fifteen years,—draw attention again to what is undoubtedly the most pressing agricultural question in Western Indus,—that of how best to provide against such a failure, and how best to utilise the land in a regime of small rainfall. Whether this can only be done by large irrigation schemes, or by the extension of wells,—or whether the crops on dry land can be made more secure by adopting better or different methods of cultivation, or by finding and using drought resisting crops is at present very unsatisfactorily known. It is, nevertheless, vital to know,—and the present disasters make it more emphatically nece-ary than ever that a large part of the energy of agricultural investigators, official or otherwise, should be devoted to settling the problem under our special conditions.

The present number of the Magazine will be found to contain a uniber of valuable articles. We would call attention to that on the "Value and Conservation of Cattle Exercement" by Mr. V. G. Gokhale, as being a distinct contribution to a problem about which little is known. The preservation of cattle exercement—whatever urine and long—is certainly done very inefficiently in most of our districts. This we know. But how heat to do it under our dry, tropical conditions is a very uncertain question. As connected with the management of cattle, we would also draw attention to Mr. Knight's article on the "Aunit Mahal Department in Mysore". We have, in a former number, given a description of the Amrit Mahal Cattle—the finest breed in India. In the present article Mr. Knight indicates how the government berds are managed in Mysore, and how the department which controls them is worked.

One article on folder demands a note. This is by Mr. K. V. Joshi now in charge of the experimental station at Altbag, on the "Sapply of folder in the Konkan." This district, though blessed with a heavy rainfall suffers much from lack of folder, and Mr. Joshi's article will be found not only descriptive but saggestic.

We will only refer to two further articles. The first of this, by Mr. T. R. Swadi on his successful campring agrinst the rice grass-hopper near Belgaam. This is the first instance of the 'hagging' system being really successful on a large scale in Western India against any grass-hopper. The second article is by Mr. K. M. Pawar, the headmaster of the vernacular agricultural school, on some experiments made by the boys at that school. We are particularly pleased to have this article, and would wish that experiments on such points as those dealt with by Mr. Pawar could be multiplied to an enormous extent.

By the time the next number of the magazine appears, the College session of 1911-12 will be a thing of the part. The end of the term will be on Jannary 31st 1912, having been specially extended by the University on account of the loss of time caused by the bolidays on account of the coronation durkar at Delhi. We send out this number with all good wishes to all who are appearing for University or other examinations which follow shortly on the close of the term.

# Address to Students

(Delivered on the occasion of the Fourth Social Gathering )

#### G. F. Kentinge, I. C. S.

Director of Agriculture, Bombay Presidency.

Dr. Mann and Gentlemen.

IT gives me great pleasure to have this opportunity of meeting you here to-day to say good-bye to you all before I go on leave; and I much appreciate the compliment that you have raid me in asking me to address you. During the last four years I have watched the development of this College with the greatest saterest, and though I am leaving my work for a time. I shall certainly not cease to take the keenest interest in all that concerns this college and the individuals who are connected with it. Four years ago this college was just starting on its career as an independent institution. Its buildings had not come into existence. The laboratory block was only half completed, and the central building where we are to-day had risen only a few feet above the ground. The hostel had not even been designed. Now you have two noble buildings, admirably adapted for their purposes and thoroughly well equipped; while your hostel has at last made its appearance above ground, and has given promise of good things to come. I confess that I am disappointed that the building is not already completed, and that I am leaving before your college has reached its final stage of building development. I realise the strain and inconvenience that must have been cancel during the past years both to the staff and to the students of this college from the fact that the college has been housed in hired buildings in a way that was nothing but a temporary make-shift. But I feel that now you are nearly at an end of your trouble in this respect, and I take satisfaction in thinking that since ron have done so well when labouring under these difficulties, you cannot fail to do better when these difficulties are removed, and you are able to settle down to work under more permanent and satisfactory conditions.

With your fine huildings, your well equipped laboratories, and your carefully laid out farm you certainly have an institution of which ron may well be proud. You have convenience and facilities for study which do not fall to the lot of many, but which will, I am sure, be steadily improved until this institution attains to a degree of efficiency 19

for the purposes for which it is designed which is second to that of no other institution of its kind. This I know is the object which your Principal has at heart; and when he sets his heart on obtaining an object of this nature, I think that you may rest assured that he will obtain it.

It is not however of the buildings or the equipment of the college that I wish to speak to-day, but of the people who inhabit it. Your college will be judged in the long run not by the facilities which it offers for instruction, but by the careers of the students which it turns ont, by the work which they do, and by the spirit which they show.

Now no soon as you take your degrees and leave this college the first anxiety of many of you must be to obtain employment of some kind. Whatever ideals and aspirations you may have formed the necessity for making your living must in the first instance press heavily prog many of you.

It is so in every country, and I think that it is pre-eminently so in this country where your family system and your custom of early marriage are upt to press heavily on many n young man who is starting his career. I do not say that your family arrangements have not many advantages, but I do think that they tend to make the Indian young man less of a free agent than is the case with the average young man in Europe, who is compelled less frequently than you are to look for immediate employment, and who has therefore more opportunity of shaping his career in accordance with his inclinations and his ahilities, rather than in accordance with his necessities. However this may be, most of us have to work. The injunction laid upon Adam was this-" Thon shalt earn thy bread with the sweat of thy brow." There are some fortunate ones amongst us who are not compelled by sheer necessity to earn their living; but such men too owe it to society to work, and to pay their way in the world; and they certainly owe it to themselves to do so, for the idle man is seldom a happy man, and there is no satisfaction to be obtained so complete as that derived from the consciousness of duty faithfully performed. We are like machines; ws must continually wear out and be thrown on the scrap heap. certainly preferable that we should wear out with honest work than rust to pieces by disnse. I referred just now to the necessity of working in order to make a living. Now I know that the Hindn Scriptures do not set great stors by wealth, and the idea of nn ascetic life of voluntary poverty may be attractive to some. It is the same with other religious. The Bible describes riches as "the root of all evil," and the precept is laid down "Tay not up for yourselves tressures apon earth, where rust and moth do corrupt, and where thieves break through and steal." So too in the Parsi Scriptures, where the sage asks the spirit of wisdom whether poverty is good or riches, the latter answers—

"Poverty through honesty is better than opulence which is from the treasure of others." For it is stated thus: "As to him who is the poorest person, whenever he keeps hus thoughts, words and deeds honest, for him there is hwfully a share of all the doties and good works which mankind shall do in the world. As to him who is a man of much wealth, when the wealth is not produced by honesty, even though he takes trouble in daties and good works and righteous gifts, his good work is not his own, but is his from whom the wealth was abstracted."

The crucial question therefore is not whether a man is rich or poor, hat how the wealth was obtained, whether by honesty or by disbonest means. I remember once, many yeas ago, a lecturor in Political Economy asked his class the following question " How do profits occur?" and one of the students promptly answered " Because there are fools;" his idea being that wealth was acquired mainly by one man cheating another. Now something like this idea seems to be held by many people, and it is quiortunately true that wealth is sometimes acquired in this way; but cheating is certainly not a necessary or general incident in the acquisition of wealth. Profits occur and wealth is accumulated when a man has the ability and the energy to prolace more than is necessary for his consumption, and has also the fragality to save the residue: and I think that there can be un doubt that every man owes it to himself and to society to try to develop his abilities and his energy to a degree which will enable him to pay his awn way and to set aside some part of his carnings. The important thing as I said just now is that the wealth acquired shall he acquired honestly. Another important matter is that, when acquired, it shall be used wisely and well. If then you accept the ideas that I have tried to place before you, we shall be agreed that we want to work, that we want to make careers for ourselves, and that we want to acquire some wealth, or at 146

any rate, that we may rightly and legitimately aspire to such objects. The question that will shortly present itself to many of you is, how you are to do it.

Io passing I may mention here that I notice with satisfaction that during the last four years a large proportion of the stodents who have passed out of their college have obtained posts io Government service. These posts provide for the mee who obtain them so assured living, and open up to them the chance of honographe and useful careers. I certainly do not blame any one who wishes to enter Government service, the more so since that was the profession which I myself elected to follow. The fact remains however that it is not possible that all the students of this or any other college can be proyided with posts io Government service, and a fair proportion of you will have to look for occupations elsewhere. The primary object of the instruction which you receive here is to teach you the theory and practice of efficient agriculture, and to fit you to undertake agricultural operations with success and profit. But the education which you receive here does far more than that; it should fit you for the battle of life in many other directions. You are taught here the principles favouring the natural phenomena which vitally affect the daily operations of these quarters of the people in this country; you are taught to observe and to think for yourselves. If you will only use your eves your training can hardly fail to suggest and the soft profitable development in the ecoomy of the country side, io which you may take a useful part. If you read the old spic poetry dealing with the heroes of by-good days you will notice that wheo a battle is described it is not the common people or the ordinary soldiers who are described, but it is only the heroes such as Arjan or Bhima who count in the lattle. So it is in the modern battle of life. It is the select few, the intelligent, enterprising, persevering and honest who count, and not the thousands of colonriess, mediocur men, still less the army of knaves and fools. We are apt to talk of the people of one country as being enterprising or ecergetic, and of another country as being unenterprising or slothful. By this we do not mean that the people of one country are all keen ar of the other country apathetic or lazy; but simply that the proportion of keen and enterprising people in one country is greater than in the other country. The actual proportion of such people in any country is seldom large, and the addition of a very few recruits to the ranks of the mental and moral aristocracy may often make a great difference. With the training that you have received it is open to any one of you to take your

place in the upper ranks, and I would ask you to remember that one intelligent, industrious and honest man is worth more than many men who have not got these qualities, and that great possibilities lie before you if you will only grasp them. Things are changing fast in India. Industry, commerce and agriculture are all in a state of transition, and the cry on every side is for men to arganise, and to bring practices and institutions into harmony with the near circumstances that have arisen. Look at agriculture. The idea is naw generally accepted that agricultural practices and agricultural credit can be organised on a more continual practices and agrantinate teast can be organized as a federative basis, that progress as possible, that properties can be detectively, implements improved, hetter seed and manure provided. Everywhere men are organised to undertake the necessary organisation, and for the most part they are looked for in vain. In such directions lie possibilities for anyone of you, apenings which may bring profit to your. selves and advantage to the community. Some of you may not have the capital necessary to undertake such enterprise at once; but there are men with the capital who would be ready to embark in such enterprises if they could find competent men to help them in the work. What you have to do is to make yourselves competent to undertake such work, and to show that you are competent for the purpose. There are many point that I might eluborate in this connection, but I fear that I should wenry you.

The most important opening, however, which lies before you I before recommending any one to take up agriculture pare and simple. Before recommending any one to take up agriculture as a profession it is necessary to be sare that he has the tacts and qualities requisite for a farmer. He must be fond of an apen are and laborious life, prepared to work hard and fairly self-reliant. He must have common sense, courage and patience. It is the greatest mistake to think that any one can make a successful farmer. The characteristics mentioned above are accessary for success, and the man who has not get them or who is likely to sigh for the comforts and delights af a town life had better keep clear of the business. But for the man who has the right tacts keep clear of the business. But for the man who has the right tacts keep clear of the business. But for the man who has the right tacts keep clear of the business, and the see life or one from which more real happiness can be extracted. The change of the seasons, the countless natural phenomena, the manifold processes of nature lavae on interest and a lesson for the farmer which they have for few others. It is cometimes said that farmers seldom grow rich. This is, on the whole true; but riches are not everything by any means, and an occupation which will provide a healthy and happy life and a fair competence is certainly and to be despised. I noticed in a book by a

well-known French writer on agriculture that he stated that he had never known a farmer grow rich unless he had introduced some change into the system of farming that he found around him; but that where farmers did introduce suitable changes he had often known them become rich. It is in fact the man who can see what is needed and do it, while his neighbours fail to see or do it, who makes a success. The whole country side in India is at present calling out such changes. It is for you students to see them and to make them.

I fear that I have read you a long sermon. I know that you are in the situation of a very strenuous day; and I do not propose to detain you longer. I can assure you that I wish you all success in life, and that I shall follow your career with interest, and shall always be gled to help any of you that may need assistance. Before I close I will read you a few verses by the great Scotch poet Burns, which express admirably what I have been trying so imperfectly to say to you. I cannot read it in the Scotch chalect as it ought to be read; but I have no doubt that on another occasion if you ask the poet's name-sake Professor Burns, to read it to you as it should be read, he will do so.

I'll no say men are villains a';
The real, harden'd, wicked,
Wha has nae check but human law,
Are to a few restricked;
But, och! munkind are nuce i weak,
And little to be trusted;
If seff the wavering balance ahake,
It's rarely right adjusted!

To eath dame Fortune's golden amile, Assidoous wast upon her; And gather gear Iv gevery wite That's justified by honour; Not for to hide atia a hedge, Nor for a train-attendant; But for the glorious privilege Of heigs independent,

The feer o' hell's a hangman's whip To hand the wretch in order; But where ye feel your honour grip, Let that aye be your horders Its alightest stouches, instant panse— Debar a' side prefences; And resolutely keep its lawuncuring consequences.

<sup>1-</sup>Very-2-weath

#### Cocoanut Cultivation in the Konkan

BY

#### S. R. Paranjpe, B. Ag.

HE coccannt palm has always been one of the most attractive us well as one of the most useful trees of the tropies. Though an present its products form a very important item in the trade of India, yet the possibility of fature development is still greater.

First with regard to the present trade, it is worthy of note that India exported 450,000 cwt. of cocoannt kernel in 1010-11, worth Rs. 70 lakhs, and oil of a value of Rs. 34 lakhs. Of this, hewever, very little was desyrtched from the Bombay Presidency, the value of fruits being only Rs. 10,472 and of kernel Rs. 21,130. There seems no reason why this trade from the Bombay Presidency, with its extended line of snitable coast on which to grow the cocoannt palm, should not be largely extended.

"The executing palm is closely confined to the tropics. The centres of the geographical range of this palm are the islands and countries bordering the Indian and Paerike occurs. Its natural home seems to be somewhere between the eastern shores of Africa and the western shores of America, though it is now grown in some parts of America also. Wherever it ventures to go beyond these limits, it loses its power of productiveness."

In Iudia alone nearly 500,000 acres are nuder coccaunt cultivation, and the whole of this area is stretched along the 'sea-coasts. In the Konkan it grows with great vigour on a long strip of land having a breadth of five to six miles from the coasts. They are inferior in size and quality, when grown further inland.

The recommut tree attains an average height of from fifty to hundred feet, having a diameter of one to two feet. Its cylindrical trunk, crowned on the summit with numerous waving leaves, called \*\*max\*\*, having a length of nearly fifteen to twenty feet, forms an elegant object wherever it occurs.

This palm grows well in a low-lying, sandy-red or medium black, deep, well-drained, sweet soil, having an access to sea-breezes.

Like many other fruit-trees it requires planting and transplanting before it takes its permanent place. The best coccannt seed is obtained from a well-grown healthy fruit of a coccannt tree in its prime, when it is about twenty years of age. Fruits ripening in Blay are considered the best for seed. The fruit selected for this purpose is allowed to ripen fully on the tree, and is then taken down very earcfully. It is not thrown down as usual, because this throwing injures the outer skin of the fruit, and thus it becomes of very little value as a seed.

This well-cared-for front is then kept in water for nearly six months; by that time it sprouts; this sproated seed of eccount is called squar. A cod-hed is prepared, in the shade generally of palms; but never in the shade of a wingo, or a kaja tree. It is believed that the shade of these trees is injurious to the young plant. It would be worth while to see, if this is only a superstition or it has some real basis. In this properly prepared seed-hed, the above mentioned sproated seed is put in; here it remains for a year, ar so,—in some places for three years. But generally when the seedling gets three leaves, ( called sayary in this stage) it is ready for transplanting into its permanent place.

This permanent place is prepared as follows:—A ditch is taken, which is four feet long, four feet broad and six feet deep; and the distance between two such ditches is eighteen feet. Half of this ditch, that is, nearly three feet is filled up by good soil mixed with some sult-sand, to make it porons; and in this the seedling is transplanted. Every year as the plant grows, additional soil is added; and thus when after five years it begins to bear fruits the ditch is completely filled up. One man getting four annas a day prepares one such ditch in one day.

The seedlings get a very small quantity of water before transplanting the when transplanted each plant gets nearly four to six gallons of water every day. As it grows, it is given less and less water. First, the daily watering is changed to alternate days, and then it is given twice a week. In the miny season no watering is required. Thus for eight months, for watering fifty trees, the small sum of two rupees eight amons is quite enfficient.

In the early growth of the tree no special manure is given, because the plant is hable to an attack of palm-weevel, and Rhinocoros beetle; and farmyard manure at this stage is stated to encourage the growth of this enomy. In some places fish-manner is put in the ditch, and it has proved a success. Just about the third or fourth year, nearly one munued of farmyard in mure is given to every tree, and this manuring is reperted once in three manths. At times they put fresh dung as manure. Our system of munuring as we call it is a ring system of manuring. It is as follows:—First we remove the earth round the base of the tree, forming a ring at the base; then in this ring the manner is put, and the earth removed is mixel with it, when it forms a ring round the hase of the place, and also a besin for water. In rainy season we are required to cover this heap of amounte, in the form of a ring, by the leaves of Red-caster or "Mongali Brand", which is abundant is our parts.

In its early days the plant requires to be protected from farm animals, sheep, and pigs, and for this a strong feneing of thorny trees is considered quite essential. In their early days the plants are also specially liable to the attack of the above mentioned issect pests, though at times these also attack grown-up trees. The remely for this attack practised in the Konkan, is to find out an attacked plant, bore a hole just above where the insect is suspected to be, and put in salt which provents its progress. About other details I can only quote the saying common in our parts of the country that, "Trees do not thrive unless you walk and talk among them."

There are many so-called varieties, but as far as I know there are only four chief varieties, distinguished from the colour of the fruit. They are:—red, green, white, and rosy. Of these the last is very rare.

The Red variety has following qualities. Its colour is red and it is the largest of all the varieties. It gives a very high percentage of oil, its shell is very thin, and its kernel is very thick and sweet. In short it is the hest variety of all for almost all purposes. A tree of this variety bears on an average twenty-five to thirty fruits per year. The other three varieties are almost of the same quality, but decidedly inferior to the red type. The green and the white are found each in two forms—one short or round and the other loog. Here the loog variety is better than the round cone in that it is sweeter, and both shell and kernel are thicker than in the round form, while it also yields a larger perceotage of oil. These varieties bear about fifty to sixty fruits every year.

There is one more sweet variety called "First". Its peculiarity is that its kernel desolves in the month like sugar, and never seems to leave any residue; some say that it is not a different variety, and I am also inclined to the same equation; this quality expears to be due to special treatment of the tree; and even the tree supposed to be of "First" is not always true to the type; finity borne only on the southern side of the tree, have those peculiar qualities. Why this is the case is not known.

A cocoanut tree is of value in every part to the people of the Koukan. From top to bottom everything is used.

Its main root or base is used for making a pot for the drum called सवास ; or when the tree dies young, it is used as a pot for आकरी, a small hand water-lift.

The wood of the trank is used for various purposes. When small it forms the beam " TRIE " of a plough, or a small he im for a house. When large it forms house posts, or when cut longitudically into halves, it forms open pipes. If none of these uses are possible, at least it forms excellent fuel.

The leaves are used to cover the roof; the smaller nid-ribs form brooms for cleaning. The base of the thick mid-rib is used ns "Sup" for watering from shallow pools of water. The thin lack of this mid-rib serves the purpose of a very strong tape for hinding various things. The shreds of the leaves is excellent material for making bankets.

Just outside the inflorescence there is a thick, strong piece of network called (चर्चा). It is used for torches.

The external thick covering of the fruit is cut and made into small hrashes, useful for cleaning grinding stones. The thin threads on the inner side called great is used for ropes, and custions, and it may very well to used for preparing brushes. Inside this is the seed, having a hard shell covering outside, and the white kernel inside. The shell forms excellent fuel, and its charcal may be used in filters with advantage. It is cleaned from outside through one of its holes and then used as a "Hooka." Now-a-days this shell is also used for making buttous.

When the fruit is young it contains nothing but a cool watery Anaid. When drunk, it is very sweet, tasty and cooling in the hot season when it is constantly drunk by the people.

As the fruit ripens the thick kernel develops from the fluid. This kernel is used for eating as it is or mixed in sweets or as condiment. The chief product from the kernel however is its oil. There are two ways of extracting this oil.

The first is very simple; the kernel is dried, cat into slices and pressed either in a country glane, or in a press. This is the usual method.

The second is as follows: —First the fresh kernel is holled in water for a short time, it is then pounded in mortar, taken out and pressed. The milk, as thus juice is called, is then boiled over a slow fire, when the oil floats on the top. It is then skimmed off and afterwards boiled by itself. This is called \$3\operation, and is supposed to have some medicinal properties. It is considered as the best healing agent for a wound. Two quarts of oil may be precised from fonteen or afficen coccanotis. When fresh it is eaten and has an excellent flavour. In the kind freshly prepared oil is often used as a cheap substitute for \$ghe\_t\$; and if it be not adulterated, it is very hard to distinguish it from \$ghe\_t\$.

There is one more use or rather misuse of this tree, and that is the extraction of very mild alcoholic fluid called "Madi"

To procure "Madi" the spathe (\$\sigma\gamm

passed round the legs or hands of the man and the tree, and then he ascends by jerks to his legs. The Bhandaries cut regular steps in the tree and avoid this bother.

The coconnet tree begins to lear fruits after five or six years; and continues to bear for an average of fifty to sixty years, though there are trees as old as one hundred years. Generally fruits are gathered four or five times in the course of the year. An average tree yields from thirty to fifty ands; superior varieties give less than the inferior varieties. One tree is worth anountly about two to three rapees when fruits are sold. When the tree is given for "Mada" the same sum is obtained without any trouble. The "Bhandari" himself gets about fifteen to sixteen rupees of which nine rupees are taken by Government for license while he usually pays about four rupees to the owner of the tree. The blance represents has own earnings.

## Melon Cultivation at Sangamner

11

# R. G. Padhye.

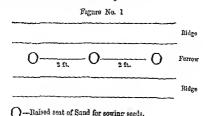
ANGAMNER is the head-quarter of the talaks of that name in the Ahmedangar district and it is a large centre for the growth of garden crops. Sogar-cane, Incerne, and onions are among the crops largely grown. Meleons, too, are grown to a considerable extent and during the summer months, the market is always full of these futils.

Meloos include two kinds of plants. One is the ordinary melou (Bot. name Cucumis melo) locally called 'Kkurkogi' and the other is the water-melon (Bot. name Citrullus culgaris) locally called 'Turkogi' or 'Kalingad'. The mode of cultivation is the same in both cases, but they are cultivated espantely.

Climate: —Both plants are grown in the bot weither, provided plenty of water is available for the roots. The best varieties of melons require a dry climate as excessite moisture in the atmosphere isinjurious to their successful cultivation. They are benefited, however, by a large amount of water when supplied to the roots. Soil:—The soil chosen is of a purely sandy or gravelly nature in the beds of rivers or streams where the roots can easily absorb water from the soil. Sangamber has great advantage in having two rivers, one of which has flowing water throughout the whole year. There are large flat beds here and a site is chosen where water is constantly available for the plants. There is no necessity of artificial irrigation, as the plants get continuous water at a small depth in the soil. Watering, in fact, is not practised at all.

Manure:—A large quantity of mannre is required as the sandy soil chosen contains practically to plant foad. Here the manure is given three times during the period intervening between sowing and flowering. Firstly it is given at the time of sowing, secondly at the time when the plants bear five or six leaves and thirdly and lastly at the time when the plants begin to produce flower bads. The manure given here is a sort of a mixed manure, manly composed of cowdung, sheep dung, earth, street sweepings, etc. Simple farmyard manure is supposed to be too strang for use.

Preparation of the soil:—The soil is selected and made ready in the mouth of December. If moisture be at a great depth, sand is taken out and the soil is made shallow in order that water may be easily accessible to the plants. The land is divided into ridges by the country hand implement called 'Khore' at a distance of about two feet and sand in the middle of the furrow is removed by means of the khore and is collected at a distance of two feet in the furrow in order to make a mised lank for sowing seeds. This is better illustrated in the figure No. 1. The beds are then made as required.



Propagation is always done by seeds. Seeds are sown at the time of 'Sankrant' (which always falls in the middle of 'Sankrant' (These sown before 'Sankrant' are said to yield greater outsurn, while those sown later always fail to compete with the first in point of yield. Five or six seeds are sown in each raisel seat shown in the figure No. 1 and covered with a little manure and sind. At the same time a little manure is given on each aide of the raised sent. After about eight to ten days the seeds germinate and when they grow sufficiently high to bear five or six leaves, only two plants are kept and the others are uprooted. At this time about half a basket of mixed mnaure is given to each plant on one side towards the ridge but alternately in the same furrow and is covered with sand from that ridge. The following figure illustrate how mnaure is supplied.

Figure No. 2

	rigure No.	<del>-</del>	
			Ridge
O 312 O 311 O 313	O 312	O 312 - O 311 O 313	Farrow
			Ridgo
O M2 O M1 O 313	O 313	О 713 О 711 О 715	Furrow
			Ridge

Site or position of the plant.

M 1-Position of 1st manure.

M 2- ,, ,, 2nd

M 3- ,, ,, 3rd and last manure.

When the plant begins to bear flower bads, the same amount of maunre as given at the second time is given opposite to the place M 2. This is shown by M 3. This manner is covered with sand from the nearest ridge. At this stage all the ridges break down and the field becomes level,

Pruning is not practised here. The reason given is that the plant gets more branches and with larger number of fruits the size of the fruit becomes smaller. Where it is done, it is only done until the plant gets a dozen branches, and these give at least twelve fruits. Here the plant yields three or four fruits at the most, the effect being that they grow bigger in size.

Fruits:—The kkurbooj begins to bear fruits in the third month and the Turbooj (water melon) in the fourth month. The signs of ripmess arry with the variety. In the khurbooj a rich perfume and a soft feel are the tests to accretain the ripeness of the fruit; but the most sure test is to handle the fruit which at once detaches itself from the plant if it be ripe. The stalk becomes dry and bence easily separates. It is difficult to ascertain the ripeness of the water-molon which experts alone can do. They tap the fruit by the finger and judge the ripeness by the sound it produces.

The fruits are succulent and clible. The sweetness varies much with the variety. In the case of ishurbooj the central portion is hollow and this hollow contains the seeds.

Varieties: —There are numerons varieties of melons. It is said that they do not breed true to the character of the fruit from which the seed is taken as cross fertilization takes place. I will mention only a few and common types.

There are two kinds of Kharhony, both differing in fruit. In the one, the inside portion is green and in the other it is brown. The former is very sweet in taste and is much superior to the latter which is not so sweet.

In the case of Turbooj there are three varieties known here as follows:---

- 1. One giving fruit of black colour.
- 2. do. do. white ..
- 2. do. do. , with black lines on it.

In the first the inside fle-h is blood red in colour but the fruit is not very sweet and hence is considered inferior. In the second, the flesh is not so red. It is very sweet and contains rery small red seeds. In this there is also one variety containing black seed, resembling it in every other point. The third is also of sweet tasto.

Insect pests are very rare. I did not see any pest as my observation was confined only to the last year, but the cultivators of this
place have seen pests, for instance an insect attacking the frunt.
Cloudy weather causes all the leaves to shirted up and thus totally
destroys the crop. There seems to be a fungus disease on the leaves
as white dots are present on them; but this does not do any
serious damage.

In conclusion, melons require a hot dry climate, a soil of saudy nature with a continuous supply of water and a large amount of old well-decayed manure. Under these conditions they do best. I could not ascertain the cost of cultivation as the area here is not measured but I learnt from a cultivator that with an outlay of Rs. 25/- a cultivator gets Rs. 50/- net profit. It thus seems that this cultivation is a very profitable one.

## Betel nut Cultivation in Assam

#### PY

# Naresh Dan.

PAPER on the above subject was read by me to fore the Agricultural Association at the Poons Agricultural College in one of its sittings in the present resum. The President, Dr. Maon, in course of his speech, observed that I should send it for publication as a supplement to the same subject ably dealt with by Mr. P. H. Ahmed in No. 4, Vol. II of this Mayrane.

In sending it for publication I would say only this that the methods of cultivation of this very important corp practice I in different parts of Assem although they agree in general, are alightly different in different localities and that I would confine invest to the description of the method or methods practiced in the locality I represent, I mean Lower Assam. I would also request the realest to refer to the self number of this Magazine in order that they may understand the climatological and the geological conditions of Assam as a whole.

Although it deserves to be cultivated on a great commercial scale, it is, in no part of the province, cultivated as such except chiefly for home consumption.

Preparation of Land:—The preliminary preparation of the land consists in clearing off the jungle, and then, growing any paddy on it for two or three years. This practice of growing any paddy completely clears off weels from the land. The roal chosen is a sandy loam and aituated high above any likelihood of unmelation.

Nest, plintains are grown on it in regular color at a distance of eight enlists can have. These keep that coil particles in finely divided condition and insure shade for both I not recilling to be transplanted there later on. And all along the boundary of the graden a hig trench, availy three fort with and about the same in depth, is dug, the earth excavated being thrown in the the graden in the form of a raised line of earth along the trench.

On this reised line of earth hambon entings together with those of Basek (Adhatoda rasica) are planted. The latter, when full grown, are used for lences.

Seed Selection:—The selection of seed is done in the field. The carlier hanches of nots are not selected for seed. The common helief is that the bunches must be washed down by the Ambubachi rain, that is to say, rain falling in the period of twelve days from the 14th of Jooe. So the later bunches of nuts are always used, and unts which have just begun to assume a yellow colour are selected and

A shady place with sofficient moisture and suitable temperature is selected as the seed bed. The upper three inches of the soil is pulverised with spades or hand-hoes called "Khanh." Sometimes sand, earth and ash are raixed together in the bed to bring about a suitable condition. The seeds are put horizontally, half covered with earth at a distance of six to eight inches apart and a layer of starw is spread opon them to maintain a uniform temperature. The best time for sowing is the month of September whoe the raisfall has almost ceased, ood heece there is no fear of the yoog seedlings belog tilled by water logging.

Transplantation:—The most common method is to transplant occe. Bot io some gardeos seedlings are transplanted repeatedly five or six times. In the latter case the palms bear froit when they are only e few feet high. The method of transplacting is almost the same every where in Assam. A distance of eight feet is kept between the plants in hopes of planting another crop of palms sobsequently, to between them, when the old crop has grown old enough. After transplanting, the holes are not filled up completely but a circular margio of three inches wide nod one and a half inches deep is kept bround the trunk, uncarthed for sometime so that it may hold rain water. But when there is plenty of rain, it is forthwith covered with cowdung, ash and earth.

When the seedlings firmly fix themselves into the soil, the land round about is frequently weeded and the refuse obtained together with fresh cowdung are applied to the tranks. Almost in every garden betel vices are allowed to grow around the ralms.

After-treatment: — Generally no watering is practised. But in billy try phones watering is usessimally produced in the young stages of the seedlings. It is done in a most primitive way, hand-watering from a pitcher being the method employed.

Water-logging is most injurious to the palms. So the very first care, on the part of the gardener, is to make suitable arrangements for draining the excess of water, coming as raio, out of the garden. A convenient number of drains, both lengthwise and crosswise, according to the natural slope of the ground, are laid in the gardens and are made to enter the trouch which runs round the border.

On the raised line of earth along the treach, mentioned above, which is known as Pagar, hamboo cattings are planted almost on all sides of the garden. To protect the garden against the intrasion of minute some fencing plants such as Baco's (Adhatoda vatica), Mondar (Lirythrina indica) and other similar plants, which can be propagated by cutting and which give a huxuriout growth in a short time, are planted which, when wooden stakes are tied on them, make a good and durable fence,

Diseases of the Palms: "Thopalms as well as the units are subject to many diseases, and insect posts. I intend to cammente only those which have not been dealt with by Mr. F. H. Ahaned.

- I. Lichens-These are exceedingly common on the pulms. It is doubtful, however, whether they really do any injury to the pulms.
- II. Tepa disease 1—This disease is very common in Asam, When affected by this disease some three or more internotes just below the leaves, become extremely short, one inch being the length in extreme cases. The plum at that part becomes constricted, and the part just allows it exceelingly swellen. The leaves become shorter and shorter and present an unlie lithy look. Subsequently, when the disease is much advanced, they turn yellow and the middle lend dries. After a short time, the whole crown is broken down at the point imanellately below the leaves. When the swelling portion is scratched with sharp knife, some two or three sheaths deep, on several places round about it, a gelatinous gundho substance exubes from the exactches, and in fifty out of one hundred cases, this cares the plant leaving the constricted part as such for over. Before bearing, the plants are liable to this disease. Before this a plant may be affected as many as four times. About ten per cent
- III. Another serious discuss affecting a part of my district for twenty years or so has been reported to me this time by men of undoubted honour and position and consequently reliability, helding large gardens. But unfortunately none could furnish me with information sufficient to diagnose it. The whole information, when condensed, is simply this. At first one or two leaves of a small number of palms turn yellow; subsequently the middle leaf dries up and can be pulled out just could not have covered in a pand fulls drown leaving the crownless palm erect for u long time.

And in a few cases the trunks also fall down. A garden once attacked will hardly have 10 % of plants suaffected.

IV. I'ulla dicease :- This is a very common disease doing a great deal of damage to the fruits. It first attacks the substance and then the embryo. The sub-tance becomes soft, white and less juicy with prominent red stripes and is correlated with the change from the usual colour into red. The fruit also cracks at the bottom. The nuts thus affected are not selected for see 1. They do not keep for a long time when preserved, nor do they germinate when sown and are more astringent than the ordinary ones. Noboly knows at what time and at what stage of its growth the fruit is attacked by this disease nor does anyboly know the true nature of the disease. There is nothing, in the cultivation of this crop, that demands a more serious investigation than this disease. The common people ascribe it to various canses. Some say that the strong guets of wind, blowing at the time when the sap has formed inside the young fruits, thus shaking the bunch to an unlesirable extent, produce this disease. Some, on the other hand, hold that the scarcity of rainfall at the time when sap is formed within the nuts, is its cause.

Harrest: -The ants are harve-ted in two instalments, and the time for harve-ting is different with different varieties. In our district there are grown two varieties, one Assamese, and the other Bengali,

Bengali variety:—The nats of this variety are small, round and have more intoxicating and astringent properties. Its nat matures when the Assumese variety begins to bear fruit. Fo it is a very pleasant substitute for the people in Assum who consume raw nuts. It is chiefly grown for home consumption and that too in a smaller measure.

Assumese variety:—This is the dominant variety and commands a good market. The units are much bigger, more elongated, and sweet. The units are harvested in two instalments—one in the months of April and May and the other in the months of July and Angust.

There is another cariety in Lower Assam known as "rutu", n eample of which has been kept in the College laboratory, Poons. It is curiously small and samply grown for medicinal purposes. The palms are thin and short and grow in clumps. They keep the same time, as regards rineing frum, with the Assames a valety.

Preservation of nuts:—In Assam the nuts are used raw and hence spid also raw. But the preserved nuts which are commonly known as "Maja Tamul" are less astringent and sweeter in tarte and hence command a higher market than fresh ones. The preservation is done in a very simple and inexpensive way. Pits are dug in the ground, in

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the open air, the capacities of which being determined by the amount to be put in, sheaths of the palm leaves are spread around the pit inside and nots are put in and covered with the sheaths, and upon them earth. The nots of the later bunches are usually selected. The maximum time allowed for keeping the nots in the earth is six months. Beyond that period the nots will begin to rot.

Income and Expenditure:—As regards the expenses of gardening I could not procure any elaborate table. But it is surely much less than that set forth in the article by Mr. F. H. Ahmed previously quoted.

Outturn depends upon the age of the palm and size of the nuts. Very old palms give fewer bunches, and the bigger the size of the nuts the scantier is the production. The money value of the produce also varies according to the market fluctuation. On an average one palm of medium age may be said to yield nuts worth Rs. 3.

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	S Entrapes				

A-Bamboo planted. B-Trench. Y-Drains.
O-Plantain to be removed. X-Betel nut.

# Note on the Amrit Mahal Department of Mysore

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#### J. B. Knight, M. Sc.,

Professor of Agriculture.

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(The following notes on the organisation of the famous Amrit Mahal Department in Mysore, which has the control of the Amrit Mahal Cattle kept by the Mysore Durbar has been written after a recent visit to Mysore. They will be, we think, of special interest -Eds )

ATHE Department consists of a Saperintendent and six Darogas. Each Daroga has a clerk. The Darogas are situated at the following ranges .- Chellakere, Holakere, Birur, Arsikere, Tamkur, Hnnsur. The Birur range contains 8000 ucres much of which is hilly and stouy.

The total strength of cattle is about 11000. These are divided into thirteen berds and usually three herds are kept at a range. The herds are composed of from four to six hundred unimals and are each ander the charge of a Scirvegar assisted by two Mundals and twelve to sixteen graziers. This staff is supplied with a cook and food, two pack bullocks being ullowed to them for conveying their baggage. while they also have u small roate tent. They are allowed to milk the cows for their ovu sapply of milk.

The cattle are never sheltered in any way and are never tied or confined in a pen. They are grazed in groups of one hundred or so, made up according to their age and condition but all come together each night. The very young calves are kept in a thorn euclosure at night. The bull calves for each group of one hundred animals are taken when young, castrated, and carefully trained to come when called, to lie down when a blanket is spread, etc. These are called leaders and the cattle all follow them. The herds are moved about from pasture to pasture as the grass and demands of the cattle require. usually returning to the same pustures twice or thrice a year according to the rainfall and quality of the pasture. Certain ranges which are moist are kept for hot season grazing, and herds are often moved from range to range according to their condition and the food available.

A certain amount of lay is cut on some ranges for feeding in the fair season in times of shortness in the pastures but no concentrated foods are over given.

The stud bulls are kept with each group of one hundred cows. There are changed from heal to herd often enough to provent bree ling of nearly related animals. The calves suckle from six months to one year. Cows do not usually conceive till the calves are weaned. Heifers are rarely sold but are bred at between five and seven years of age and continue to breed till they are twenty years old. The bulls are sold to Government and the public at four years of sge at from Rs. 200 to 400 per pair, while specially good ones may bring even more. The young bulls are very difficult to rope and train but once brought to the yoke they become docde. The Amrit Mahal is a long time coming to full maturity, growing often up to eight years of age. Future stud bulls for the Amrit Mahal Department are selected when one year old. A second selection is made for supplying breeding bulls to District Boards and others. The others are enstrated. The cows too old for breeding are kept in separate groups.

All calves are branded within a month of birth. The system of branding is as below :-

- (1) Ou the shoulder the herd number.
- (2) On the thigh the year and in males the quarter number.
- (3) On the rump the serial number of the year in the case of females.

Records are kept showing birth and parentage of each animal.

During my recent visit to Mysore, I had the opportunity of seeing groups of animals from herds Nos. 14 and 2.

The animals on the whole are very uniform in shape. Their bones are fine and their limbs clean cut and neat in appearance with no loose skin. The heads of the buils seen were much finer than the so called Khillari found in Southern Satara. They do not have the heavy overhanging brow so common among the Maswad Khillaris. In the cows the horzs are slender and arise near together and run backwards nearly parallel or slightly diverging and at the points form a graceful

enree forwards. I did not see any old bnilocks but I was told that their horns should resemble those of the cows. There is no loose skin around the sheath in the bnllocks and very little in the dewlap.

The principal colour is squirrel grey shading to white; in some individuals the grey is blotched with white especially about the face.

The cows were larger than I expected. They are considerably taller than most of the cows of the Bomlay Presidency except Gujerat and only about a hand shorter than those.

The cattle were quite tame allowing their herders to fondle them nor did they seem afraid of me although, being a stranger, they did not allow me to come near enough to touch them.

# Notes on the Cattle in the Tellingana of the Nizam's Dominions

#### BY

# B. Govind Rao, B. Ag.

FIHE following notes of some of my observations during a recent the tour may be of interest, because the Nizan's Dominions lie aside from the usual track of agricultural observers. That State possesses no agricultural department, and, therefore, though it contains some of the richest tracts in the centre of the Indian Peninsula, these are little known.

The observations were made in the course of n journey to Yeland-laplads, the site of the well-known Singareni coal mines. In order to reach this spot, a railway journey was required through a portion of the Waraugal district, covered with some of the densest forcets in the State. So wild is this district that the villages seem little else than groups of huts harred all round with a thick hedge of thorny bumbosshere a common feature of the jungle. The sole occupation of the people here is cattle breeding, and many of them live on raw roots called Sannagadda (warrer) and Chimagadda (farmer). The agricultural condition is exceedingly backward, and few crops are grown, but, on the other hand, the cattle are excellent.

These cattle are nearly all oxen, the number of huffaloes heing almost negligible. Though no regular principles are observed, and no definite purpose is kept in view in the breeding of these nnimals, yet the method a lopted is similar to that of the Raturis in Gujerat. The animals are permed at night in open stalls, and are let out in the morning to pasture, which or account of ample rainfall and the well-drained light sell, gaves ab value or of sweet grass. The cores and bulls are herded separately white grazine, the young of both the sexes being allowed to follow their dams. The cows which are poor milkers are not milked, being left to enckle the calves. Thus, the animals which most probably belong to the Nethers breed or are of a breed allied to it for reasons given below, live an an almost wild condition, and are consequently well built, beauthy and strong, inheriting at the same time an extreme timbility of strongers. The reasons for my inference as to the breed are the points of resemblance in the eyes, ears, berns and the general white or iron-gray colour of the body, as well as the fact that the strip of counter a look is the daturi district.

From these breeding centres roung heifers and balls when about a year and a ball, or two years old, are taken in large numbers for said into other districts. Thus said is generally conducted on the occasion of rectain Jatras, Melas or Crus held in some towns, as Bhongir, Khamman and Jeitkul. The animals so parchased are mixed freely with the previously existing case in the country, and hard together indiscrimentally. The result naturally is that the cattle have become very mixed and much inferior. It is, however, gratifying to note that the breed, as it exists in these Wiringal jungles owing to want of good communications, is yet, as a rule, uniform. The permilling colour is white, there being also many in littlerils of iron grey colour, white on the neels, with a few rul, and some few black animals.

The following are the characteristics of the Telingana working cattle:-

Face small, narrow and somewhat dishy. Herns short and blunt, taking first an entrand curve and then going inward a little up and there stop; or they grow entward only a short distance, terminating in a blunt point. Eyes and muzzle are black. Eyes are placed on the sides of the forchead. There is not much development of dawlap and the skin about the sheath. Tail long with a bothy switch. Hump short. Nock thin and long. Cheet rather deep than wife. track level but loins a track. I egs thin. The animals, on the whole, are of arrespe dum wholes, with a compact frame; and are self-deeted, suited to the tract, the greater perion of which is all light soil.

I presume that, if the common causes of deterioration of a breed, which need not be specially mentioned here, be avoided and then a regular system of grading be adopted with the nicely bred cattle of the forest villages. I have above mentioned, the present progeny of Tolingana working animals will be raised to a higher standard and will, in course of time, attain the larger size and the well-proportioned limbs of their forest friends.

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## V. G. Gokhale, L. Ag., Superintendent, Agricultural College Farm, Poons,

ETHE question of sufficient supply of manne is becoming more 'il' and more serious and most progressive cultivators are looking out for sources from which they can meet the increasing demand.

This article gives the results of the experiments carried out on the Agricultural College Farm in some of the lines in which the cattle excrement can be saved and utilized in an efficient and cheap manner.

The cattle excrement which can be turned to manure is of two kind,—the solid and the liquid, or the dung and urine of cattle.

Observations have been made on both these substances in the experiments on the College Farm.

For this purpose two pairs of ordinary-sized Deccan bullocks have been kept under observation. Their names and average weights are given below:—

#### DUNG.

The experiment in this line consisted of finding out how much mature a cultivator can make by carefully storing all the solid excreta only which he can collect, in an urdinary pit made in the medium black soil. With this intention the solid excreta,—dang,—from each of the above two pairs were separately weighed daily and stored in a pit together for both the price. The pit was six feet in diameter and three feet deep. The experiment was commenced from 2nd September 1910 and the same pit received the quantities for four months.

The following table gives the quantities obtained month by month for each pair separately, and the daily average .---

Period.	I. Lavaaga—Jambhala.		II. Gulyu—Phowya.	
	Quantity per meath.	Duly average,	Ceanfity per menth,	Daily average.
	list.	lba.	lbs.	lbs.
2-30 September 1-31 October 1-30 November	793 800	21 25·6 26·6	692 877 903	23·0 28·2 30·1
1st December to (3rd January 1911).	000	23.6	856	25.2
Total	3006	24-2	3328	20.8

It should be noted that the pairs were in the cattle shed only for fourteen hours each day, except a few rainy days, which in the above period were only ten. This is exactly the condition which can be expected with n enlituator.

No litter, straw, waste fodder, water or any other substance was added.

The pit was emptied out on the last day of the period (January 4th, 1911). It weighed 4846 lbs. when taken out. The whole stuff except the top-layer of six inches was thoroughly rotten and in an excellent condition to be applied to the field. It was therefore immediately spread in one of the plots of a series specially set apart for testing and comparing the various methods under experiment, and ploughed in.

The observations were continued and the emptied pit used again for storing the dang for another period of the next five months. The figures for these appear in the following statement:—

Period.	*Invanga-	I. -Jamblala.	II. Gulja—Phowja.	
	Quantity per month.	Daily average.	Quantity per month.	Daily average.
	lts.	lbs.	lbs.	lbs.
4-31 January	509	18-2 15-9	569 644	20·3 23·0
1 01 35	658	21.2	716	23-1
1-30 April	201	12-1	641	21.3
1-20 Mar	399	15-0	374	16-7
Total	. 2277	16.5	2944	21.3

The contents were taken out of the p.t. on 21st May, when it weighed 1992 lbs. It was also observed that the dang was dried into makes except the bottom layer of one foot, shoring that in hot weather the natural moisture in the dang was not sufficient for the proper decay of the dang and addition of water might have help-I the decomposition.

This was applied immediately after removal to another plot in the series.

It can be deduced from the above figures taken together that 674S lbs. of good manute ready for application can be obtained from two pairs in nine months. This would mean about eight cardloads, for a cardful of manute round about fooms weight 899 lbs. This will come roughly to 6 carts per pair by anoman.

#### URIXE.

No attention has ever been even to be given by any cultivator to utilising the cuttle urine for manure, in the Bombay Pre-idency, though the sub-tance is certainly more valuable than the dung.

<sup>&</sup>quot;Note: —The quantities of the samp is the case of Erigin is very low in the months of February at April, which is due to one of the follows (Jaubhila) bring and and in the hospital, and consequently gos under observation from 22nd to 23th February and let to 6th April.

In order therefore to demonstrate its value, and at the same time to compare it with dung, the following methods of conservation have been adorted.

- Collecting the urine as such through a drain over the sloping paved floor of the cattle shed and applying it to an irrigated crop through the irrigation water.
- 2. Absorbing the urine in some absorbing material spread under the feet of the cattle.

To demonstrate the first system, two plots each four gunthes" were allotted. There were transplanted with onions in the rabi season of 1910-11 on 1st February 1911, and had to be irrigated. One plot did not receive any manure but the other received 200 lln. of urino at each irrigation (at the interval of 10 days). The urine was stored in an earthern jar of 20 gallons capacity with a small hole at the side of the bittom, which was made of n size calculated to discharge the whole contents gradually during the time it usually takes to irrigate a four gunthe plot (which is nearly one hear). This jar was kept just near the plot over the main water-channel, which supplied the water to the plot.

In all 14 vaterings were given and the results of outtarn per acre are given below:-

Treatment.	Outturn of onions per acre.	Estimated value.
	lhs.	Rs. a. p.
Urine given as described above. No manure	25880 21530	161 12 0 134 8 0
Gain due to prine	4350	27 4 0

The cost of collecting name was only trifling. This system however involves the expense of having a stone paved floor which is about 18. 25 per pair of cuttle. There is no definite data as to how much urine can be obtained from a pair of Deccani bullocks. But it will not be an over-estimate if 20 lbs. be taken as the daily quantity per pair.

<sup>&</sup>quot; A guntha is one fortleth of an acre.

This will be just sufficient for a four guntha plot to be given every 10 days. This quantity when applied to an coion crop for five months fetches a value of Rs. 2-7. At this rate the annual out-put per pair will be worth Rs. 6. This should be able to pay for the extra cost of payement within four years, after which period it will be a net gain.

The second system consists in spreading some absorbent material under the feet of cattle as litter, which will absorb the urine as it is drouped and will return the manuful ingredients.

The articles that can be advantageously used are dry friable purified earth or gand. The red soil from thin sloping soils, or the alluvium or and from stream kanks may be used. Further, any other wavte product which has a sufficient absorbent power such as groundant shells, safilower shells, jaddy husk, dried leaves, refuse folder or weeds may be emplored.

In the methods tested and demonstrated on the College Farm, (a) river earth and (b) the groundant shells were used.

(a) The dry earth system:—The first of the two pairs mentioned in the beginning was set apart for this experiment. Dry earth was obtained from the tire side from behind the agricultural quarters and a six inch layer spread under the feet of the above pair on 24th July 1910. It weighed 1891 lbs. at the time of spreading. It was also analyzed before use and the composition was as given below:—

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Nitrogen ... ... 0.13 per cent,
Phosphoric acid ... 0.22 ,, ,,
Potash ... ... 0.15 ,, ,,
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The dang was removed daify and the wet patches stirred and made dry brieging the dry protions from below and from the sides. This was continued for five mouths and ten drys on the same earth. After the above period it was removed,—on 3rd January 1011. It weighed 1560 lbs. at this time. A representative sample was again sent for analysis, which was reported to contain:—

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Nitrogen ... ' ... 6.48 per cent.

Phosphoric acid ... 6.69 ,, ,,

Potasb ... ... 0.82 ,, ,
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The decrease in the weight is due to so oo quantity of earth being necessarily and inseparably stack to the dung and removed to the pit along with the latter.

It was observed that during the above period there was no objectionable smell or any other appearance of insanitary conditions in the place, nor was the health of cattle affected.

It would thus be seen that the following quantities of plantfoods were actually conserved from the urms by the dry earth system during five months.

Plant-food element.	Before absorption 1891 lbs.	After absorption 1550 lbs.	Gain.
Nitrogen Phosphoric acid Potash	lbs. 2-45 4-16 2-83	1bs. 7.44 10:69 12:71	1bs. 4-99 6-53 9-88

The quantity removed from the cattle shed was on the same day applied to a third plot of the series already mentioned.

Another lot of fresh dry earth as large in weight as on the first occasion was again spread on the 4th January, removed on 23rd Jane and applied to another plot in the same series as a duplicate. This weighed 1867 lbs. at the time of removal.

(h) Groundant shells:—These are obtainable in very large quantities in groundant growing tracts but have never been used as manure, the reason told being that they take n considerable time to decay. It was thought however that if they are used as nn absorbent of urine, not only can the urine be conserved, but the intrinsic manurial value of the shells themselves can be utilised. The manurial value of this material can be very well judged from the following figures of its composition:—

Nitrogen ... ... ... 0.95 per cent.
Phosphoric acid ... ... 0.25 ,, ,,
Potash ... ... 0.35 ,, ,,

A six inch layer of this material was therefore spread under the feet of the second pair on 24th Jaly 1910. The dang was removed daily and the litter stirred as in the case of the dang. It was noticed that the stuff was used up in about a month and had a tendency to become foul. It was therefore removed on 2nd September 1910, and

thrown in a pit for decay. Its weight to start with was 192 lbs. and this at the time of removal was 391 lbs. It was also noticed that the stuff was rendered fine by trampling of the bullocks. Representative sample was analyzed at the time of removal and was reported to have the following compositions.—

Nitrogen ... ... 1.47 per cent.
Phosphoric acid ... ... 0.28 ,, ,,
Potash ... ... 2.03 ,, ,,

From the above data it can be deduced that the following quantities of plantfoods can be conserved in forty days by the groundnut shells:—

Plant-food	Before absorption	After absorption	Gain.
element.	(192) lbs.	(391 lbs.)	
	lbs.	lbe.	lbs.
Nitrogen	1-90	5:74	3·84
Phosphoric acid.	0-53	1:09	0·58
Potash	0 67	8:13	7•36

The litter of groundout shells was removed about every month, and the weights obtained recorded at each removal. They have been shown in the following statement:—

Date of spring.	ead-	Weight at the time of spreading.	Date of removal.	Weight at the time of removal
		lbs.	<u> </u>	lbs.
24- 7-10		192	2- 9-10	391
2- 9-10		192	4-10-10	395
4-10-10		192	1-11-10	245
1-11-10	1	192	2-12-10	257
2-12-10	}	192	1-2-11	204
1- 2-11	•	192	2- 3-11	297
2- 3-11		192	2- 4-11	245
2- 4-11	}	192	4- 5-11	235
4- 5-11		. 192	G- 6-11	215
Total	<u> </u>	1729	11	2484

All these were stored in the same pit for the above period of ten and n half months. A layer of earth was occasionally spread over to compact the mass and exclude it from the heat of the sun.

The whole quantity was then taken unt of the pit, when it weighed 1490 lbs. (including added earth). It was noticed that the whole mass was thoroughly rotten except two or three layers at the top. It was immediately applied to a plot in the same series as before.

By comparing the figures of plant foods conserved by the two methods, dry earth and groundant shells, it is seen that the groundant shells have absorbed and retained much better than the dry earth, taking equal periods for both. The dry earth has conserved only twenty-five per cent of the Nitrogen and Potash in a period of five months of that by the successive dozes of groundant shells during the same period. To what this may be due is not yet understood. No loss of Nitrogen in the form of Ammonia was suspected at the duily visits to the place. Supposing this however to have occurred, or the Nitrogen to have been lost by denitrification, the deficit in Potash is at least unaccountable. It is not also understood whence the dry earth got so much Phosphoric acid more than the groundant shells.

The series of plots which has been set apart for testing and demonstrating the effects of various methods received the manures as stated above, before sowing. Varadi cotton has been sown on all these plots in June. The following deductions can be drawn from the present (15th September) appearance of the crop.

- 1. The first plot of daug, two plots of dry earth, and that of groundant shells are a decided advantage over the annuau plot.
- 2. The second plot of dung (i.e. the one receiving the quantity from the dry weather months-January to May 1911) is a little better than the unuanned one, but authing like the above. The dried dung though ploughed in had not sufficient moisture or time for decay and it is being brought up at the surface by the inter-tillage implements.
- The dry earth plot receiving the quantity from one pair from Angust to December 1010, is as good as the dang from two pairs for the same period as far as the present appearance can tell.

 The groundant shells is at present the best of the lot, but it represents the urine conserved for 101 months as ngainst 6 months of the remaining plots.

From what has been said about it can be clearly seen that the urine is at least as valuable as the dung of cattle for the same period and that it is possible to conserve it in a very simple, inexpensive, and efficient manner. It is thus possible to double the supply of manner to the resources already existing.

The Question of the supply of good fodder in the North Konkan.

# K. V. Josbi, B. Ag.

brught forward by the people of foller is one of the difficulties, brught forward by the people of Konkan, whenever deiling with the np-keep and mantenance of cattle, Now-a-days the condition of the cattle is said to be much lower than forwards. Cattle often die during the months of Jane and July—when their cervices are very much required for plonghing—due to not getting nearly enough food during the previous hot wetther.

This is the more important as it is evident in India that cattle form the right hand of a cultivator. Hence in trying to consider agricultural improvement in a tract, the question of maintaining the condition of cattle becomes one of the most important of these considered. If this object can be secured by extra labour or by the expenditure of money, every good cultivator will take to the former, as the condition of the cultivators in the Konkan is extremely poor. They are asked to spend anything in cash, they are unable to do it. Hence if the question is tackled from the manual labour point in view, that is to say, that the cultivator need not spend in cash but can gain the object simply by his and family's work and labour, it is much more likely that the desired object will be attained.

Aside from the question of good housing and clean water for drinking, a full supply of some good fedder is by far the most important point in the up-keep of cattle. In the Konkin generally rice straw is the only staff ased as folder. Grass is used but to a limited extent, as it is either exported to Bombay or used for harning: (Rab). No concentrated food or folder is given by the average cultivator to the cattle. Those cultivators who, side by side with agriculture, do the business of carting, give about two pounds of oil-cake per bullock per day till March, after which the Bhurs of Wal ( Dolicho: bablat) a mixture of the pols and leaves is given. But this only the working pair gets. The rest lives on grazing if available by day and one bundle of four pounds of rice straw per head by night. Rice straw is an extremely poor folder and even of that the cattle do not get sufficient. In spite of the practice of not grawing may folder crop in Konkan, the only one folder that of straw, is not available for the cattle in the full quantity which is grown in the fields. The cultivator himself is a partner in this, because, he athless a large quantity of it for thatching his house every year.

Special attention in feeding is given by well-to-do cultivators in the working season. In the Konkan the real help of plongh cattle is required from the beginning of June to the middle of Angust—two and a half months continuously—without any div's rest, for sowing, ploughing and transplanting. After this generally the remaining part of the year is a rest to the cattle. Where Rubi crops of Wal and gram are taken, the plough cattle have to work for a month or so in November. But the percentage of Rubi crops is small in Konkan, as it depends upon the moisture-holding capacity of the land and the unistance of wild and stray cattle.

From the millio of Angast the new green grass becomes available for the cattle to graze but at this time it is very smill in growth. From September to December (both inclusive) good grazing is available and consequently the condition of the cattle is improved in this season. It is really in this season that the development of the body of young ones takes place. In this season the supply of drinking water also is good and sufficient. In fact of the twelve months of a year, there four months are the most favourable for the eattle.

By January the grass is cut and either exported to Bombny or stored for 'ttab'. Consequently grazing becomes poorer until at last no grazing is available from February to Angust. To add to this inadequate supply of faller, the supply of drinking water becomes very short so much so that in several vallages cattle are required to be taken to a very long distance for watering and in some cases dirty water is given to them. Both these difficulties have a marked effect on the condition of the cattle. The good appearance of the cattle of December is day by day gradually lost, till at last many of them are reduced to a mere skeleton in June and July. This is found in the case of average cattle both males and females, young and nid, and is by no means an exagregation.

What is required to improve this condition is a good supply of some kind of good fodder and the following are the suggestions to remedy this:—

The other day while travelling from Surat to Bombay, I saw the erop of 'Tag' (Suno) in several fields between the Bulars and Gholwad stations, growing very laurieutly. More than half of this tract is in the Thana district, that is, it is part of the North Konkan. There seemed to be a large enlitivation of this crop in this tract and it occurred on my mind that this can be utilised in a good folder for the cuttle for nbont a month and in half. I wondered as to why cultivators, in the other parts of the Thana nod Kolaba districts, should not take to this crop.

The difficulty that they might raise is, that sufficient moistner is not available in their soils. But if this crop is sown chiefly with the folder idea in view, any growth of the crop from one foot to three feet is welcome. Sann, however, becomes fibrous afterwards and then the cattle will not eat it. It can only be fed when upto one month's growth. A small quantity of it will keep the cattle fresh. blorcore on inquiry I learnt, that the yield of rice after the crop of Tog (Sann) is decidedly increased in these tracts. Hence the advantage of growing Tog as a Rati crop in all the fields is two-fold.

On inquiry the following information was collected regarding the crop:--

Tag or Sann:—This crop is largely grown between Bulsar and Gholwad stations of B.B. A. C. I. Railway, the whole of Unbergoon Peta, part of Dahanu talaka, and the Daman states. It is both grown as a klamf and rahi crop, the objects being totally different in the twn seasons. The kharif crop is chiefly meant for fibre while seed is the only point in view in the case of the rahi crop. The Kharif crop is taken in a large tract—Bulsar to Bassein—along sea coast, as Tag fibre is in great demand by the

fishermen, and fetches a gool price. Moreover, as it is taken on the Varkas loads, in the kharif senson, it does not interfere with the crop of rice. The rahi se uson crop is taken after rice in the rice fields nod the tract where this is done is very limited. As fibre is in view, the kharif Tag is sown very thick—not to allow branching. The rahi is sown rather thin.

As the khatif crop is not allowed to fruit, no seed is obtained from that crop for sowing next yetr. Heace it is sown in the rubi season for seed. This sowing furlitates branching and so more seel is obtained. The surplus yield of seel is fed to cuttle. They told me that no stray cattle are allowed in this truct till the rubi crops of wal, gram, and Tag are over. Hence no fencing was seen round the fields. Tag is also sown mixed with wal.

The quantity of seed sown per acre, and yield of fibre and seed per acre, could not be known deficitely; but from six to eight time; the seed sown is the yield of grain.

In some parts of the tract mentioned, the Tag plants in green condition, are given to bullocks used for carting, as folder, but this nos is very limited. In my opinion if Tag is sown in all the rice fields in the North Konkao throughout it will serve as a good green folder in the months of January and half of February because, the dates of sowing Tag in the early and the late rice fields, will range within one month.

When wal is sown after rice, it should be sown very thick and thinned out afterwards little by little every day and fed to cattle.

Groundant is a new crop introduced in the Konkin, and it was observed by me last year that if sown thick, it has a tendency to produce very much green matter and less pols than usual. If sown at a greater distance more pols and less green matter are produced. I saw last year pluots three to four feet long. This if kept in n silo or treated otherwise, will be a kind of good folder in stock,—where there is more trouble from rats etc. groundant may be grown as a folder crop and preserved. This may be given with advantage in the mooths of March, April and May. The Bhusa of wal is also a good food for cattle in March, April and May.

It was also observed at Panvel that jouver grows well on varhas lands and its cultivation as a folder cop may well be introduced in the Konkan, and it will be of a se in June and July if kept in stock till then.

If some substitute he found for thatching the houses of cultivators, a large quantity of straw can be made available for the cattle.

If hay be made in time, that will serve us a gool fool. Hay is largely exported to Bombry. They tell roe that if grass is cut in flower and not allowed to fruit, the quantity of grass that one can resp next year is reduced considerably as sufficient seed dues not fall on the graund. As grass is exported to Bombry, they always look to the quantity and not much to quality. Hence grass is allowed to ripen well and the seed to fall on the ground.

Whenever substitutes for Rab are mentioned to a cultivator, be always hrings forward the difficulty of pyting in each for the maure, while he says he can burn his land simply by manual bloom. In this case also the same difficulty will be put before us by the cultivator. Hence the engoestions made above are each as can be carried out simply by manual bloom. In some parts the cultivators are filled in the rahl season and if they give it up and become revely for labour and work they are sure to improve the condition of their cattle without any actual out-of-cocket expectiture.

An account of the description of rice grasshoppers at Belgaum.

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T. R. Swedl, L. Ag.,

Entomological Assistant.

Title destruction done to several crops in the Deccan and III Karnatak by several types of grasshopper has bren increasing constantly in recent years. Of the insects which do the damage, two are the most prominent,—the Deccan or joing grasshopper (Colemannia sphenarioides) which chiefly attricks journ and bajri, and the Belgram rice grasshopper (Hierosylphus banian) which his become a most rainous pet in the very rich tract in which rice is cultivated near Belgram. The work to be described in the present paper was done in an attempt to hold the latter in cheek.

The appearance of these Belgaum rice grasshoppers in large numbers dates from ton to fifteen years ago but was not found to cases very serious damage to rice-crops till about five to six years ago, when the attention of the revenue authorities of the place was attracted to it.

To destroy these various stomach poisons were at first tried for one or two years by spriying porsonous solutions on the chief food of these hoppers riz. rice-plants but no success could be achieved of the correction of the torrectial rams at Belgumm maching away the poisons thus sprayed, and also on account of the cost being prohibitive. Thea mechanical methods were resorted to, and the first attempts were made with a net invented by Mr. Stockholm for the rice-fields of the Central Provinces. This was far from satisfactory as it was heavy requiring nine mea to drag and therefore became very unweldy to ase in the small terraced and flooded rice-beds of Belgram.

In the year 1908, the attention of the Rombay agricultural department was directed to it. And to combat this pest they also tried various stoauch pursons with no effect, but succeeded in preparing a net so as to suit very succeedably the conditions of the need lands of Belganai out of many patterns invented and tried. The net is described below and costs only Rs. 1-12-0:—

It is a simple bug with a month open on the broad side. The material used is course ganny sucking costing about two and a half annus a yard of forty-five inches wide. The bug measures nine feet by three feet at the month and is forty-five inches wide. On the broader side two bunboos are tied to the lower and upper side of the month. A rope is sown into the hem of the month to afford sufficient strength.

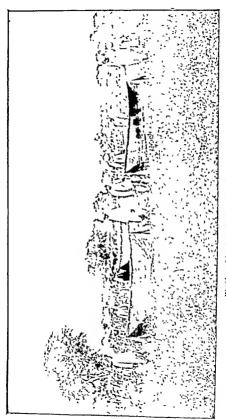
In operation two men hold either side of the hamboes which are kept long enough to afford a good hold, and run about the field against the direction of the prevailing wind. The larg should long loosely so that the lower lumboe may daughe on the crop. When they run this way the larg opens well and the hoppers disturbed by the humboo jump and fall into the larg. When the end of the field is reached a man specially provided for the purpose brashes and empties the hoppers into a small bug which he carries with him.

The use and effectiveness of such netting was demonstrated to the cultivators but on account of their apathy for such work they would not take to it. The Agricultural Department therefore organised a campaign in the year 1910 with a view to remove this pest and also to convince the people of the effectiveness of the system. For this contributions were mised by the collector, and the agricultural department bere all expenses in connection with the establishment viz. cost of preparing bags, supervision of 1 bbonr etc. The area infested was divided into four divisions of about 2,000 acres each and a batch of thirty nets was kept working in each division under the supervision of a mukadam. One latch finished an area of 40 acres and killed on an average 300 lbs. of these hoppers in one day. The work was done for full thirty days and the pest was greatly reduced and about twenty-five to thirty per cent of a full crop of paddy was obtained that year.

The same work was continued this year and in forty working days, more than 185 millions of these insects were killed at a cost of Rs. 2,834/- from an area of nearly ten thousand acres.

As a good result of the last and this year's work, the rice crops have been quite eaved to the value of seventy-five per cent of n full crop and it is expected that the pest will almost disappear though the operations will have to be continued at least for one year more to amphilists is

There are two things which I must emphasise in carrying out this method of combating the rice grasshopper. These are: (1) the adoption of the remedial measures from the first appearance of the pest and (2) co-operation. The first is important as prevention as better than enre, and the second is essential because one man may clear the hoppers from his fields that if his neighbours do not follow his good example, it is evident that there will be invasions of these insects into the cleared fields from the neighbouring nucleaned ones.



Working with nets to Catch the Rice Grass hoppers.

# The "Koleroga" disease of Areca palms.

BΥ

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Assistant Professor of Mycology
AND

G. S. Kulkarni, L. Ag. Of the Lycological Department,

HROUGHOUT the North and South Canara districts, a serious is disease known by the above name occurs in the Betelant plantations. The name signifies, an Canarese, "rotting" which indicates the chief symptom of the disease namely, a falling down of the unts in quantities and rotting. It affects chiefly the unts, and causes great loss in yield, sometimes the entire gardens heing covered with a thick covering afforting unts. It necessionally also extends to the stem through the peduncle and the tree then dies. But the number of such deaths is not considerable.

The disease usually makes its appearance with the beginning of the monsoon, is at its worst during the month of July and August and continues till the end of September. Occasionally the disease is said to occur as late even as November, of there should be late heavy rains. The climatic conditions, which favour the disease and enable it to assume the epidemic form are frequent heavy showers interrupted by brooks of smekine.

We had occasion, during a recent tour in the Karwar District, to make inquiries both of officials and grafen-owners in connection with the damage caused by this disease. The loss has been stated to vary from 10% to as much as 75% of the whole produce and in extreme cases the entire crop is reported in have been lost. Taking into consideration the total area noder betelunt in the Karwar district (Sirsi-5800 acres, Sidda-par-0415, Xellipar-2530, Honavar-1688, Ankola-742, Kamta-617, Total-17828 acres) it is easy to see that the loss due to this disease is very serious. The average produce per cent is stated between 14 Khandies to 24 according in the quality of the garden, which means an inconce of Rs. 150 to 250 per acre. Taking the average income to be two hundred rupees to the acre, the total money value of the betelunt

crop in the District would come to Rs 3,500,000 and the loss from the disease, calculated on the supposition that the average loss all round is only 25% amounts to as much as Rs. 030,000 at least per year.

The "Koleroja" appare to have been occurring ever since the cultivation of Sapari began but as with many other fungoid diseases, its curies was abscure till quire recently. The people in those parts invari-ably attribute at to the ruins at the Ardlesha Nakshatra, and holiere it to be broug at down by these runs directly. The possible connection of parasitic fungus was first suggested by Dr. Butler, Imperial Mycologist, Pasa, who found a species of Paytop'there on the rotting nots.
The discise was further carefully investigated by Dr. C. Coleman of Mysore and the results of the investigation and also of experiments in combiting the disease have been published by him . He has definitely proved that the Kolsroja is due to a Phytophthora which he names provisionally, Phylophthora omaicora car areca. If n nut which has just fillen from the bunch as a result of Koleroga attack be examined, its surface is seen covered with a greyish white, mould like, substance. If a tiny portion of this be scrapel with a needle and examined under the microscops, it is seen to consist of a number of fine threads which constitute the vegetative part or mycelinm of the fangus and of oval or elliptical, holies which are the fruiting bodies of the faugus. The mycelium occupies the tissues of the unt and derives noureshment at their expense and as a result of this interference the nut falls to the ground where the injury is completed by numerous suprophytic fungi and buttern and results in a general 'rat'. The fraiting bodies or sporangia of the fungus are produced outside on the surface of the aut. When mature, they liberate motile spores, known as zoospores, which are carried away by the wind in ruin drops on to fresh healthy nots, where they realthy germinate and start fresh centres of attack. The zoospires are thus the chief mains of spreading the disease from plant to plant. In addition to zoo-pares, this fungus produces, according to Dr. Coleman, another kind of reproductive hodies, the osspores. These are thickwilled resting epores, which lie dormant from one season to righter by which the furgus is able to continue its existence from your to your. These probably remain in the diseased parts and possibly also in the soil, though, Dr. Coleman states that he has never actually observed them in these places, but has found them occuring about intly in artificial cultures of the fungus.

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With regard to the methods of combating the discuse, the preventive measure universally adapted by the cultivators as a regular rantine process in cultivation, consists in tring books or covers made out of the head leaf shouths of Areca leaves, known locally as "Kottes". The making of "Kottes" is quite an elaborate process. The leaf sheaths are collected, day after day, as they full to the ground and are preserved carefully in a suitable place until the beginning of the rains They are then cut into shape and statchel and made really for use by skilled labourers. The actual trung of " Krites" to the banches re quires even more specialised labour than hotte-making. On the whole the process of Kotte-tyng is mther an expensive one, especially in Sirsi, Siddapar and Yellapar Tulakas, where there are no local Kette-tiers, the e having to be brought all the war ever from places below the ghats and from Mys me. In 1:el the cost per acre of Kottotring in places above the ghats has been state I as varying from Rs. 15 to 25 and even Rs. 30 per acre In Hasver, Ackels and Kamen, the cost of Kotte-tying is much less, but still consulerable, varying from Rs. 8 to 15 per acre. Moreover, although Kotte-tyong is fairly officient in preventing disease, when done carefully and in good time, there are certain difficulties connected with it which relace its efficiency considerably in practice. The " Ketter" are liable to ro: by the heavy rains and to get torn off by strong winds. In places above the ghats, the services of the Kette-tiers are not always available just at the right time. The caltivators there have to wait notil the Kotte-tiers come over to them from places below the gasts, so that it often happens, that the discuse has already appeared before the preventive marine is adopted and Kotte-tying does not do much good, once the disease is there. The caltivators knew this, but such is the dread with which they look apon this disease that they go in for Kotte-tying at such expense, even on the off chance that it may give them some relief.

Now Dr. Coleman has been making extended experiments in Mysore during the last four years in combiting the disease and it appears from his publications on the subject that he has had considerable success. Retried spraying the banches with a mixture of Copper Salphate, lime, and read in certain proportions in several gradens, side by side with Kotte-tying. Sammarsing the results of experiments

See Mullison's Text book on Indian Agriculture. Vol. III p. 260 for further details about Kutte-tying,

carried out at various centres in the Mysors province during 1902, he states, among other things, "that spraying with a mixture of proper constitution invariably proved more efficient than the trying of Kottes, even when spraying was done under comparatively unfavourable circumstances." "Spraying served to check the disease where the trying of covers proved practically of no avail." Further, "the materials for spraying (copper sulphate, lime and resin) can be supplied at a cost of Rs. 3 to 5 per acre." Also "spraying can be done almost three times as fast as Kotte-tring with the result that the cost of labour can be considerably reluced." "The total cost of spraying including labour and materials will hardly exceed that of Kotte-trying leaving out of account the cost of preparing Kottes."

In Circular No 3 on the Koleroga (Mysore Department of Agriculture) Dr. Coleman recommends the use of the following spraying mixture —

- (a) 5 lbs. of Copper Snlphate dissolved in 12 gallous of water.
- (b) 5 lbs. of Lime slaked in 12 gallons of water.
- (b) is poured into (a) accompanied by constant stirring and then (c) is added to make up the completed mixture."

This mixture is filled in a special kind of sprayers. These are worked by compressed air and their advantage consists in the fact that they can be conveniently tied to the back of the cliniber, leaving his hands free. The same men are employed to do the spraying as do the Kotte-tying at pre-ent. The spraying is commenced late in Mayor carly in Jone and is continued whenever short breaks occur in the rains. The number of aprayings necessary depends largely on the rainfall. A second spraying is necessary, Dr. Coleman writes, in some cases, in August or early in September, if a slight sign of the disease occurs. In many cases only one spraying has been found sufficient.

, In a recent letter Dr. Coleman writes to us that the work has been so successful in Mysore that he is planning to hand over the spraying operations to the garden owners themselves. This is very encouraging and it is to be hoped that the experiments which the Bombay Department of Agriculture contemplates at Siria and Siddayar will prove the superiority of the spraying treatment to the Kortevtying to the satisfaction of the cultivators, and that they will eventually be relieved from the commons losses which they suffer at present from the Koleroga

# Mannurial Supply for Sugarcane.

## G. N. Sahasrabuddhe, L. Ag., Barlados (West Indies)

TATHEN I arrived in the West Indies the first thing that struck my intention was the low cost per ton of growing cane in those islands in spite of the high rate of wages prevalent here as commored to India. As the readers of this Magazine are aware the cost of growing cane in the Poors District, exclusive of the manufacturing expenses, comes very nearly to Rs. 400 for a crop of 40 tons i. c. the cost of growing per ton of cane there is Rs. 10. The cost of growing cane in the West Indica varies in different islands and may be taken as 6 Sh. to 10 Sh. i. e. Rs. 4-S to Rs. 7-S per tan. Of course here the cane is grown without irrigation, so that they have not to pay any canal-water charges, but that gain is compensated by the high rate of wages. In Poona district the usual rato of wages is as. 4-5, in the West Indies it varies from as. 12 to Re. 1-4 per day. This shows that in spito of the high rate of wages the West Indian planters produce cane at a much cheaper rate than we do in Poons. When I followed up the question more closely I found that this difference was mainly due to the cost of manne in the two places. In Poons half the expenses of the caltivation are due to manure. The Poons cultivator spends no less than Its. 5 on manure to produce a ton of cane. In the West Indies the actual expenses for manure do not exceed Its. 2 per ton of cane. In fact, as far us I am nware, there is no other country, except the Sandwich Islands where so much money is spent an manure as in Poona district.

Here a puzzle might uppear how heavy crops of cane can be obtained without manure? Not that the West Indian planters do not upply manure but they make the cane itself pay for manure. As any body, who knows plant chemistry, can see, the products that we itesire from sugarcane whether gal ar sugar are carbohydrates, containing hardly any of the plant food materials. All these plant food materials remain in the waste products are tops, trash, megass and scum. So that if these are returned to the soil, for growing a crop of cane we do not make any serious demand on the plant food contained in the soil, the carbohydrates we seek for being products in water and air. The West Indian planter understands this fact and carries it into practice. Out

of the three hye-products trash and scum he returns directly to the soil. Megass he has to burn as fired. But this megass is mostly composed of carbohydrates with small quantities of actual plant foods. He returns the ash to the soil. So that the only plant food he loses is a small quantity of nitrogenous substances. The tops are fed to the cattle and the dang and urine are returned to the soil as pro manure. So that he returns all the plant food maternals that he obtains in the shape of cane except that lost in combostion while burning megass and in other manipulations. This loss he makes good by a small does of some outside manure. Besiles this small does of extra manure he pays for nothing.

When the Poona cultivator burns all his trash as fuel, loses large stores of organic matter and nitrogenous substances. When he is a careful man he returns the ash and the dung from the cattle fed with cane tops. But the organic matter and the nitrogenous substances he loses by huming trash, have to be supplied in the form of purchased farm-yard manner and other manures purchased from outside at a great expense.

In order to make this point clear i. e. how much loss is sustained by conclitivators in barning trash I had asked Mr. P. C. Patil, the Dirisional Inspector of Agriculture, Central Dirision, to make some determinations about the quantity of trash obtained per acre. From the data kindly supplied by him I get the figures given in the adjoining table. Samples of trash were submitted to Dr. Mann for analysis and I am obliged to him for the austytical data. In these determinations, unfortunately the actual weight of case per acre was not determined and I am obliged to give appearimate figures in the last two columns:—

	Trash lbs.	Composition 56			Quan	tities Ibe	a. Per	Approximate	lbs, of cane to a lb, of	
No. per acre,		N. K. 0 P. 0.		N,	$K^{*}0$	P,0,	The men	trash.		
I.	7520	0 37	0.72	0 16	52 851	54 596	12 032	67200	8-9	
II.	10350	0 28	0 50	0-03	25-111	51 900	9-342	89600	8-6	
ш	9412	0.38	0 50	0-11	35 766	€ <del>7</del> 060	10 352	78400	8.5	

The Roman figures in the first column are as follows :--

- Quantity of trash obtained in Walwa taluku (Satara district).
   Cane under well-irrigation. Green leaves dripped while cane growing. Mean at two observations.
- Quantity of trash obtained in Nira Valley first-plant canes.
   Cane under canal irrigation. Mean of five observations.
- Quantity of trash obtained in Nira Valley from ratiou canes.
   Caus under canal irrigation. Mean of three observations.

From the above figures it is clear that by burning trush the cane cultivator loses 4 to 4½ tons of a valuable organic manure which is equivalent to about 10 cart-loads of farm yand manure as far as the bulk is concerned. This loss has at present to be made good by parchasing farm yard manure from ontaile. Now in the Poons district the price of the farm yard manure thus purchased is Rs. 2-2½ per acre; i.e. burning trush costs the cultivator Rs. 20 to 25 per acre. If this trush is saved it means that this much is a net gain to the cultivator.

In West Judies the trash is regularly used as meanre in this way. After harresting the plant cane, all the trash is arranged in alternate furrows and the farrows from which the trash is removed are ploughed up. After harresting the first ration crops, the trash is arranged on the furrows which were previously ploughed up, and the furrows which were previously covered with trash are now ploughed up. So that the position of the furrows in successive years becomes like this.

FIRST RATIONS. PLANT CANE. SECOND BARDONS Cane row. Cane row. Cane row. Trash arranged. Furrous. Ploughed up. Cans row. Cane row. Cane row. Ploughed up. Trash arranged. Furrow. Cane row. Cane row. Cane row. Trash arranged. Furrow. Ploughed up.

Of course in the West Indies cane is grown on rain water alone and therefore this system of arranging the trash does not offer any difficulties. But in In II on an account of the necessary irrigation system, such an arrangement of trash on the field is impracticable. But there the trush can be removed from the fields and stored into some adjoining pit where it will mt properly tall the time of application comes.

New here a question will arise, what about the fuel supply? The trash is at present hurst as fuel and unless we have some other cheap source of fuel, money gained by conservation of trash will be spent in buying fuel. But this difficulty is only superficial. As a router of fact the fuel supplied by cane in the form of megass is quite sufficient to evaporate all the jnice. At present we have to burn trish in addition to megass because we are still contented with our old methods of boiling. There is no other country besides India where they ham trash-for want of fuel. I cannot enter into details here, for want of space, about how this is done. But I can assure the reders that I have gone through this whole question of fuel supply very carefully, and I am perfectly convinced that if we give up our present method of evaporation on open fire and if we allow steam to do that work not only we shall not require any other fuel besides megass but we shall get a better product at a distinctly less coat than we do at present.

Now supposing we are propared to cave our trash let us see how we stand as regards our manaurial expenses. At present we grow a crop of 40 tons of plant-came to the acro the usual dressing is about 10 tons of farm yard manuro and about I ton of oil cake. At present the furm yard roanure supplies most of the large quantity of organic matter that is necessary to grow cane under irrigation system ; while the oil cake supplies the majority of the nitrogen, potash and phosphoric acid. the form of these two manures we are at present supplying to the field about 10 tons of organic matter, about 350 lbs. of nitrogen, 150 lbs. of potash and 100 lbs. of phosphoric acid in round figures. Experiments have shown that these quantities are essential to get a good crop of cane. Now in Poons district it is usual to get two crops of cano on the same land ziz. plant-cane crop and ratoon crops. From these two crops, as can be seen from the figures given above, we get 19792 lbs. of trash (or very nearly 20000 lbs ) which farmisbes 75:21 lbs. nitrogen. 28 96 lbs. potash and 19-69 lbs. phosphoric acid and approximately tons of organic matter. If this whole trash is saved and applied to the soil there remains to be supplied 3 tons of organic matter, 274.79 lbs. of nitrogen, 51.04 lbs. of potash and 80.31 lbs. of phosphoric acid.

We can ak nature again to supply part of these constituents by growing green measure crops for instance. By growing green renumer crop, we must clear a measure on the spet instead of getting it, from natade. Of course, the green measure crop gets its supplies of potash and phosphoric acid from the soil itself so that there are not actual additions but as regards nitrogen and organic matter, these we get from air and water and therefore these are distinct additions. From the time the last crop is taken of from the land which is to be, put under can

till the time cane is actually planted, there is usually ample leisure to take a green dressing crop, so that no time is wasted. Then again the preliminary enlitivation that has to be given for cane land will lenable to take a green dressing crop without my outra expense except the cost of seed which is comparatively trilling. So that the addition of mitrogen and organic matter that we get through the medium of a green dressing crop costs us hardly any thing.

Let us see what we actually gain by it. Here again I um indebted to Mr. Patil and Dr. Mann for the data. Mr. Patil has found out that a green dressing crop of san ( crotalaria janeia ) at the time of flowering weighs from 16900 lbs. to 28000 lbs. per acre according to the condition of the crop, and its composition as given by Dr. Mann is as follows :- Moisture 80 5%; Nitrogen 1.77%; Potash 2.09%; Phosphoric acid 0.97°/. Taking the mean of Mr. Patil's determination we get an average eron of 22000 lbs. per acre and this much crop furnishes us 4200 lbs. of dry matter containing 75.93 lbs. of nitrogen, 80.66 lbs. potash and 41.61 lbs. phosphoric acid. So that with trash and a green dressing of san we meet the domand for organic matter and potash fully. There is a deficit of about 200 lbs. nitrogen and about 40 lhs. phosphoric acid. This deficit can be made good by a manure like fish which is very rich in both nitrogen and phosphoric acid or wo might use some suitable chemical minure to supply these two ingredi. ents. Fish usually contains 8 % nitrogen and 7 % phosphoric acid, so that 2500 lbs. of fish per acre will supply all the nitrogen required and a large excess of phosphoric acid. Of course it will all depend upon the current market rates as to which manure will be more econe. mical. But considering generally this ton dressing of manure, which will have to be actually said for, need not cost much over Rs. 100 per acre. This shows that using trash a mannro and growing a green dressing of sra, both of which practically cost very little, will save to the cultivator nearly Rs. 100 per acre thus reducing the cost of cultivation to Rs. 300 i. e. about 7-8 per ton of cane produced, which comes near to the cost of cultivation per ton of cane in most other countries.

But all this depends upon the saving of trash and saving of trash means giving up our prehistoric method of boiling that we at present follow. Steam has done wenders in many other industries and it will do similar wonders to the Poona cane grower provided he is sincerely tired of remaining behind the world.

# A new Gul boiling furnace for the Deccan.

P. C. Patil, L. Ag.,

Divisional Inspector of Agriculture,

N this furnace I have tried to combine the good points in the Poena and the Khandsari fornaces. The latter is found in the United Frorinces. The pan used on the Poorn fornace supplies a larger evaporating surface and the furnace has got an under-ground passage to supply fresh air and an ash pit for receiving the ashes from the furnace. In the Khandsari system a scries of five hemispherical pans is arranged over a corresponding line of furnaces and the hot gases from the lowest or the first furnace are passed under the remaining ones and are finally allowed to go out through an exit hole on the other side of the highest or the last furnace thus taking the greatest advantage of the heat generated in the lowest furnace. The exit hole, allowing, as it does, the used up gases to escape serves as a chimner.

It is presumed that the readers of this journal know the Poona furnace. The details of the Khandsari furnace and pans do not seem to be necessary.

The section of the proposed combination (figure 1) makes all the details of construction clear. The wall of the lower finnace (i.e. Poons type furnace) has n bore 16 inches wide and 9 inches deep about two feet six inches from the bottom of the farnace. The bole opens up in the shullow sancer shaped furnace about eight feet in diameter, placed a little above the first, to the other end of which a c "inner connection is opened.

The storing you is kept on the upper formore and the sugarcane juice, as received from the mill is stored in this pan. This has been provided with to cock. By means of this cock and a trough the juice, in the storing pan is led to the lower or the boiling pan to finish the final concentration therein. When the gul is ready the pan is taken off in the natal way and emptted into the cooling pan. It is then returned on to the lower furnace to receive another dose of juice. To start with, 'juice', has to be put in both pans, one charge in the boiling and one in the storing pan.

In constructing this kind of furnace it is advisable to put the lower or the Poons furnace a little deeper in the grount than is sual. By this arrangement the price will not have to be lifted nunccessarily high.

In the preliminary trads, the temperatures and specific gravitie, were taken to get some idea of the value of the waste heat. Of the reveral trials one is given below to illustrate the use of this waste heat.

		Tempera	tures in degrees.	1
Operations when tempara- tures were recorded.	Time at —	Boiling pan	fen peratures in the store tank or pan.	liemarke,
	11-55	20	30	Corrected specific gravity 16.87
Soum is gathered in the holling pan		85	27°	
Rolling begins in the boil-	12-37	36,	529	
Boiling pan is ready to take off	2-53	116°	869	do. do. 22.94 (often it goes ap to 26.5).

As will be seen from the above table we started with at 30°C. at 12·25 p. m. i. c. after 35 minutes when some gathers on the judeo in the boiling pan the temperatures rue by 55 and 7 degrees respectively in the two pans. At 12·37 p. m. a further rise of 11 and 15 degrees is recorded. At 2·32 p. m. when the boiling pan was ready (at 116°C) the judeo in the tank has risen to 88°C. So the waste heat has raised the juice (1000 lbs.), from 30° to 85°. (In some cases is has reached 97° even ) and has evaporated a good proportion of water m the luide.

To start with we have got for every 100 lbs. of juice 10:87 lbs. solids and 83:13 lbs. water. By the time the boiling pan becomes really the juice in the tank is concentrated and it contains for every

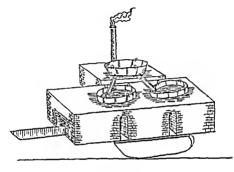
100 lbs, of the concentrated juice 22.94 lbs. of solids and 77-66 lbs. of water. We must however remember that the total quantity of solids in the given quantity of juice has not increased. On account of the evaporation of some water the proportion of the solids to water has increased.

The quantity of water per 100 lbs. of original juice is, therefore, as follows:—at the beginning 83:1 lbs.; at the end 50:0 lbs. 26:2 lbs. have therefore been evaporated by the waste hest, or nearly one-third, hefore the puice is delivered in the boiling pan.

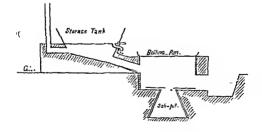
In the month of May 1911 this fornace was tried with the Poona furnace. The results of the tests made are recorded in the following tables:—

	THE	NEW I	LEVE	æ		THE POONS FURNACE,						
Date	Sernal No. of Pan	Jaice in the	Time re quired to boil	Kind of	Caratity of fuel to boil Unit	Dite	Serul No.	Juice in lbs	Time re- quired to boil	Kind of	Countity of	
May 4th 1911	1	1000	2 37									
,,	2	. 1	2 22				1			1		
6th	1		2 29	Mogass	413		i					
**	2			. Ao.	271		2	١.		Megana	222	
£th	1		3-20	do	430	at Shola-	1	1000		do	355	
,,	2	.,	2.3	do	242	Par May 31st	2	,,	2 16	do	270	
**	3		2.7	đo	242					1		
,,	4	"	2.9	Trash.	213	8th May	1	1000	2.	Trash.	390	
10th	1		3.7	do.	416	10th		,,	2 45	do.	39	
**	2	.,	1.55	do	262	,,	2	,,,	2 29	do	34	
**	3	-	2-3	do.	262	,,	1			do.	,59	
,,	4	,	1.4	do.	262	"	2			do	46	
	1	1100	8.7	Megass	468	38th Apri	1 1	1100		Megass	38	
	2	"	1 5	do	253	31st May	2	,,	2 22	do.	28	
	3	1 .	2-8	do.	293	Mth Apri	1 3	"		do	35	
	4	1	2-13	do.	277		1	-		do.	31	
	5		2.3	do	277							
	6	"	1-5	do.	277	I	1	i				

## Sketch of the New furnace



Cross-Section.



From the above statement we see that the Poons furnies takes about 2) bount to boil down 1000 lbs, of julies to gut and requires 358 lbs, of meyers (or 353 lbs, of trish or pushat) for the first Adhan (charge) and about 325 lbs, of meyers (or 239 lbs, of trish) each, for interpret thinges.

The new furnace (figure 1) requires 3 hours and 10 minutes to bell the first Adhan consuming about 426 lbs, of meyers (or 436 lbs, of trash) and all subsequent Adhans only two hours cach requiring about 213 lbs, of meyers (or 262 lbs, of teach) only.

The Paters furnises regulars about 656 of the, megasi to hell 1855 the of furer and takes from two to two and half hours for each failing (or by proportion about 435 the, of furl for 1999 the, of alex).

Taking a day's output to be 1253 × 6 = 8118. He, of julce (for flaters, as qualithers), the consumption of fact and the approximate times required by the three different furnaces will be as molecular.

Kind of fara	Min,		l'asi saqu	ised daily,	I'nal required par		
			Wagass His	Teach Ha,	(36000 the, of Inton)		
Patara farnasa	,,,	"	2524	3926	17456		
Propositionaco	•••	•••	2003	2832	11858		
The new furnace	***	•••	2227	2276	9476		

Taking 65 per cent, extraction with 60 per cent, moisture in the fresh megas, we get 14 Hz, readily combactible negass for every 65 Hz, of juice. The quantity of dry mayers for 20000 Hz, of sugarcane juice, therefore, works to about 7753 Hz. In actual practice newwork only about 7590 Hz, of dry megass is adjected. The trash or sugarcane leaves from one ares, if credully collected will weigh about 7000 Hz, of the flatars District). In practice however only about 500 Hz, of trash Is available for learning purposes. The total quantity of fuel available (megass and trash together) is therefore 12200 Hz.

Kind of far	nace.			quired per	Extra fuel required for an acre lbs	
Fatara furnace		٠	12300	17500	4800	
Poona furnace			12300	11900	٠	400
New furnace			12300	9940		2400

From the above table we see that the Satara farmace requires 4800 lbs. (over and above the available trash and megass costing Rs. 20/-) and the new farmace not only requires no additional fuel other than trash or megass, but with it there is a surplus of megass and trash of 2400 lbs. per acre, which can be sold or kept as manure. (The trash is rich in manurate value). Ville the appendix I.

The Poona furnace neither requires allutional fael nor admits of any considerable saving.

The new furnace requires considerably less time than either the Poons or the Satara furnace which is a point of very great importance for the Satara cultivator who boils five to eight pans a day on one furnace.

The introlaction of this new farmace is calculated to effect a saving in labour in addition to a large part of trush in the Sholapur Detrict.

In some places in Sholapar District the cane planter uses two furnaces and in mapping of cases four furnaces for each mill. One mill supplies paice for all these furnaces; thus each furnace has to bot only two Addans a day (instead of four as in Poina and six to eight as in Satara Datrict). Each Addan takes about four hours.

If however the new farnace be used instead, both time and labour can be economised; in fact one double furnace, that is to say, one farnace of the new type, can treat all the eight Addams as proposed for Satars. But the people in Sholspar District are accustomed to boil only two, they will consider it hard pob to boil eight Addams and I therefore propose modification of the same for Sholspur.

Figure 2 gives a diagram of the plan proposed for Sholapur District. The two boiling pans are placed on two separate furnaces (and are fired independently) having the store pan alone common,placed on a raised shallow furnace without any ash pit or underground passage for admitting air. The hot gases from the two lower furnaces are led through holes (as in figure 1) to this common furnaco where it heats the purce in the storing pan as described in the last case and finally escape through the channey. Two Jalaras and two Gularas will thus do the work of four Jalaras and four Gularas working for about the same number of hours. In Sholapur District the cultivator spends much money to build a line of four furnaces as well as to purchase four boiling pans and four cooling mans. The construction of this new furnace will certainly cost less; moreover he will save the cost of one boiling and two cooling pans. Leaving the saving in the untial expenditure, the cane planter can save, at any rate, the labour of two Jalaras and two Gulacas or say about Rs. 3/- a day or about Rs. 14/- an acre, taking about 7000 lbs, of gnl to be the average outturn per acre.

#### APPENDIX I.

Samples of trash were sont to the Agricultural Chemist for analysis to ascertain the value of mannial nagredients in the trash. The subjoined table gives the analysis supplied.

	Pundya trash Manjri.	Islampur pundya trash.	Baramati Ratoon trash.	Baramati New cane trash.	Khadya cans trash.
Nitrogen	-36	-37	-38	•38	-33
Potash	•74	.23	•20	-50	.21
Phosphoric sold	-00	-16	-11	.00	-10

From this table we see that about 10 lbs. nitrogen, 15 lbs. potash, and 3 lbs. phosphoric and cut be secured from the surplus trash left by the use of the new furnaces. From a purely theoretical point of view about Rs. 9/- worth maunro is thus secured ont of the available fuel. From a practical business point of view it may or may not pay to use this as manure and I leave the question for some future article.

## Notes on the Cultivation of the Soil.

K. M. Powar, B. Ag.,

Headmaster, Vernacular Agricultural School, Poons

IN this and in some succeeding articles, I wish to give a short report of the work done by the students of the Vernacular Agricultural School Poons with the results which they have obtained. In the present I mean to give a short account of the rabi crops which were raised by them in the last season on the agricultural college farm,

For this three plots were reserved each of four gunthas. In reserving these plots the intention was to show the boys the importance of thorough cultivation. Each plot was again sublivided into portions of two gunthas. The previous treatment given for each was us follows :-

The land was first ploughed once with the cross plough. The clods were broken by the ordinary mainda and ane harrowing just before the rains. The plots were almost level. No manner was given to the plots; but the previous crop was an irrigated garden crop. There was n difference in the after treatment, one plot being given harrowing every eighth day and the other every fifteenth day.

Generally two or three barrowings are given to the land reserved for rabi crops. But here it was purposely arranged to treat the land so as to show the effect of extra cultivation.

The crops sown were Shalu Jouar (Dagadi), wheat (Bakshi) and gram. All other factors namely seed rates, variety, etc. were the same. No irrigation was given. The shalu and gram plots were sown in the last week of September and wheat in the first week of October.

Before sowing the harrow was used for cultivating the land and afterwards the ordinary hoe with slit was used. The interval was the same. This hoe was continued natil the crop was nearly six weeks old. and after this another bue without any slit was employed. The distance between the rows was one foot. The distance was purposely kent large to facilitate the work of hosing. This was continued till the crop was two and a half to three moaths old.



" finilya ". The well known bullock on the Marwar Ferm, that can draw thirty two loads.

The results obtained are us follows :-

Ha	770	wing e	cery	15 days.	Harrowi	ng e	cery 8 days.
		Crop.	•	Number of	Crop.	-	Number of
	11	tilies.		harrowings.	pailtes.		Harrowings.
Shalu.	_	ő	_	4	8		- 5
Wheat.		3		5	4	_	9
Gram.		8	_	5	91/2	_	Ð

From the above figures we clearly see that the outturn was very lurgely increased by the extra cultivation which was given to the plots. From the above experiments it was clearly seen that more care means more outturn. And the boys were convinced of this-

The chief object of cultivation as usually done, may be stated as follows. In the first place weeds are killed. In the second, perhaps the even more important purpose of conserving the moisture in the soil is secured. The soft surface also favours the absorption of any rain water that may fall. It decreases evaporation and hence maintains an eren temperature by acting as a sort of covering to the soil.

It fayours evation and leads to the oxidation of the poisonous materials arising from decaying organic matter and supplies oxygen to the soil bacteria-

It is also important to entitude at the right time in order that those purposes may be properly served. To preserve mosture the right time means as soon after rain has fallen as possible, and the same timo is suitable for the destruction of weeds. For the weeds germinate at that time and destroys them immediately. The soil must of course he dry enough to cultivate or damage would be done to the tith. It would be wrong, however, to leave it until ten days after the rain when the weeds have grown largely and the surface soil is hard enough to turn into clods when worked. To cultivate at the wrong time means less work and more expenses because the soil being hard and weedy cannot be worked easily.

From the above figures it is clearly seen that frequent cultivation brings in more outturn. But at the same time it must be done when the soil is in suitable condition otherwise it may do more harm than good.

### Preliminary Observations on some Drought Resisting Plants of the Deccan.

G. B. Patwardhan, B. Sc.,

Superintendent, Ganeshkhind Botanical Gardons.

TURING the days of anxiety caused by the withering condition of crops of some plots in the Ganeshkhind Potanical garden, Kirkee, undoubtelly caused by the non-unally long drought which has prevailed since the early sowings of crops after the first slowers of June 1911, the writer's thoughts became diverted to observe the effect of the weather conditions on weels and unsown veg-tation. Accordingly in the course of three days from 26th to 20th July (1911), observations were made in the Ganeshkhird garden and the neighbourhood and as a re-ult two small lists were prepared one of plants which presented a di-tre-ed appearance due to want of enough vitality to withstand even the beginnings of a dry season and another of those which farel well under the same conlitions. In the plants of the former group (A) the leaves bad flarged, the margins of the lamina curled up, and they also often drooped down from the tip of their petioles ( Lagacea mollie ). In some cases only a truft of leaves at the extremity of the plant remained alive, the lower ones baving dropped already (Lagarea mollie and Euphorbia geniculata). In others, the life of the plants was Lastened to completion by the formation of flower bads on the terminal axis (Zinnia). In the latter group (B) a large number of plants were of spreading habit and deep rooted. Some completely covered the ground underneath by a dense matting of their procumbent branches. There were a few others also of an erect halit ( Peoralea cerylifolia & Sestania aculenta ). In list B, comparatively, plants belonging to the Leguminoses are greater in number than those of any other orders so far examined. The plants mentioned in the lists were found growing in or on the margins of cultivated fields under complete. by dry surroundings mostly in medium black son of fair depth.

LIST A.

Cassia occidentalis Vern. Thorla Takla. Cassia tora—Vern. Takla. (धारटा टाइटा) (टाक्टा)

In the above two examples, only those growing along road side were observed.

Lagasea mollis.	
Zinnia elegans.	
Systanthes arbortristis. Vern. Parijat.	(पारिजात )
Plumeria acutifolia. Vern. Kherchafa.	(सरचाका)
The two above mentioned trees were in an unirrigated	i border.
Bankinia tomentosa.	
Datura fastuosa Vern. Dhotra.	( पातरा )
Nicandra phaseoloides.	
Ipomoga muricata. Vern. Bhowers.	(भाविता)
Ipomoen corcinea.	•
Ipomoca quamorlit. Vern. Ganeshrel.	( गणेशंबर )
Tecoma stans. Vern. Nagchafa.	(नागचाका)
Oroxylum indicum. Vern. Tetu.	(हेड)
Barlerie cristata,-Vern. Koranti.	(कोन्हान्दी)
Sanchezia nobilis ) These three were in a shrubbery	
Duranta plumers Aralypha wilkesiana for a long time.	•
Euphorbia geniculata. Vern. Dudhani.	(ह्याणी)
Comphrena globosa Vern. Gultop.	( ग्रन्टॉप
Achyranthes aspera. Vern. Aghada.	(अघाडा )
Guazuma tomentosa.	
Montansa workleis (?) planted in an unitrigated border.	
Canna indica. Ditto. Vern. Kardali.	( स्ट्बी )
Wrightia tomentosa. Ditto.	
List B.	
Peoralea corylifolio Vern. Baochi.	(बाबची)
Alysicarpus longifolius Vern. Sherra.	(दीवरा)
Alysicarpus rugosus.	
Alysicarpus pubesecus?	
Indigofera glandulosa Vern. Barbada.	
Phaseolus trilobus. Vern. Jangli Math.	( जंगली माठ )
Heylandia latebrosa Vern. Godhadi	(गोधडी)
Tephnosia purpurea Vern. Unbali.	(उनवद्धी)
Crotolaria orixeusis.	
Polygala chineusis Vern. Negli.	( नेगर्छा )
Seshania oculeata Vern. Ranshevri	(रानशेवरी)
Indigofera linifolia Vern. Barbada.	

Cassia pumila Vern. Sartual. Rhyncosia minima.

Apluda taria. Andropogon annulatus.

213	L.
Acacia lencophloca Vern. Hewar.	( दीवर )
Tanner nudicaulis Veru. Pathri.	(पर्धा)
Echinops echinata Vern.	( 121 )
Tridan procumbens.	
Cardiospernum helicacabum. Vern. Kapal phodi.	(कपाळ फोडी)
Dodonea viscosa Vern. Jalhmi.	(जसमी)
Hibiscus ficulneus. Vern. Ran bhendi.	(सन नेंडी)
Biophylum sensitivum.	(414.761.7
Lavandula Burmannu.	
Cryptostegia grandiflora.	
Capparis horrida.	
Ipomoca hederacca Vern. Bhours.	(भांतरी)
Ipomoca reniformis. Vern. Undirkani.	(वंद्वीररूपी )
Argyrea cuncata. Vern.	(421(1:01))
Acalypha malabar.	
Lantana camara.	
Guiacum officinate.	
Trichodesma indicum amplenicantis	
Vitis carnosa. Vern. Tamnya was found growing amon	
Commelita forskalcis. Vera. Kena.	g grass (तामन्या) (केना)
Cassia mimusoides.	(441)
Phyllanthus scabrifolius.	
Phyllanthus madraspatancusis Vern. Kanocha.	(कनीचाः)
Euphorbia hyperecifolia Vern. Dudhmogra.	(इध मोगरा)
Euphorbia pilulifera.	(दूध मागरा)
Corchorus trilocolaris.	
Justicia diffusa.	
Oldenlandia aspera Vern. Phapti.	(फाप्टी)
Anotis montholms. Vern. Fuls.	(জন্ত <b>)</b>
Ischocnum pilosum Vern. Kunda grass.	(क्रेंदरें)
Arıstıda hystrix.	(3,4, )
Manisuris granularis.	
Panicum seachne.	
Setaria glanca.	
Cenchrus biflorus	

#### Kanmi Cotton Cultivation in Anand Taluka.

et

### M. L. Patel, B. Ag.

Title cotton, knova as kenni, in the truct which lies round the 42 torm of Anand is similar to Braich cotton. The truct itself is as a saidy form. Today the, possessing a soil which is best characterised as a saidy form. Today these circumstances kenny cotton, having a long growing period is generally grown where there are unigation faulties. The cultivators have, therefore, invented an ingenious methol of saving impation charges, which are very beavy on account of the wells being from fifty to seventy feet deep.

In this tract Lady's fingers or Bhindi Hibisous Esculentus is taken as a hot weather crop. Provious to the last one or two irrigations of the bhindi crop, karni cotton seeds are sown among the plants. This takes place in the beginning of May. Thus the seeds grow for fifteen to twenty days under these irrigations, which must in any case be given for the blandi, without any special cost. After the first rainfull, the cultivator uproof the bhind, plants and cultivate twice between the cotton plants with an ordinary hoe at the interval of a week. After the second minful they transplant Barto (Elensine cororana) seedlings in alternate rows with the cotton plants. The Barto is ready about the end of October and normal outturn is about thirteen hundred pounds per acre. The picking of cotton begins from the middle of December and hence the crop is not much affected by frost if this occurs. In the season 1919-11 though there was severe frost, the outturn of seed cotton was, on the average, about two hundred and eighty pounds per acre.

#### Contribution to the study of lac.

EY

#### T. R. Kotwal.

Is Babul ( Acara arabica ) las a distinct species and requiring motherlac from Babul to start the cultivation?

Fig. report of my experiment has raised this question. The entomoby logist to the Birals State has written to me to the following
effect: "I have read your account of 'Experiments in lac inoculation' published in the Poom Agricultural College Magazine Volume III,
No. 1 pages 42—44, with great interest and pleasure. I am
anxious to know whether you innoculated the different kinds of trees
with the seed sticks of Bor (Zixyphus jujube) tree or with those of
corresponding trees."

I have answered this question in a letter I sent to the Daily Indu Prakash, Dombay, on the 7th Jane 1911. I have therein quoted Mr. Leftoy (The Agricultural Journal of Iudia Vol. IV., part III, July 1909), but the question may perhaps be discussed in these columns. Mr. Leftoy says: "Bibil has is apparently a distinct species and to start the cultivation one must obtain the mother-las from Babil." In or let to decide this question I brought mother-las from Paus and innoculated, with the mother-las from Bar (Zizyphus jujuke), two Dabil trees at Siswal. The experiment succeeded. A sample was sent to Dr. Harold H. Manu, with a sbort libitory of the experiment.

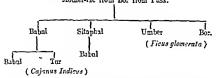
Pefore my experiments I had studied Mr. LeIroy's excellent article. I wrote to the Departy Director of Agriculture, Sind, for mother-lac from the Babut tree but I god a reply to the effect that "it would be advisable to apply to Mr. LeIroy as nothing has been done with lac in Sind so far. It exists here in a natural state on Babut trees and is not propagated artificially."

My beart was set a por experiments on Debd as Mr. Lefror remarks that the potentialities of the tree as a lac producer equal those of Bor and there is immense scope f r readering profit tible lands that are now of little value except as a source of firewood and grazing for goats. Though field in my attempt to get Babul mother-last the enthusiasm created by Mr. Lefror's article found reat in another direction and I resolved to innoculate Babul trees with Bor mother-lac, Great was my joy when I won the knowledge that the cantious language of Mr. Leftoy was justified. It is proved that to start the cultivation on the Babul tree one can innoculate it with Bor mother-lac, or with mother-lac from sitaphal (Anona sequamosa). I have successfully used this latter mother-lac in June 1911 for innoculating a Babul tree at Saswad. The insects are in a healthy condition and are five weeks old.

Mr. Stibbing remarks: "There may be more than one species, sub-pecies, or race of the 11c insect present in the country. This point although of very considerable scientific interest and importance, has not, upto the present, received much attention." Mr. Leftor shares the above view and as my experiments thow a light on the question and the view of Mr. Leftor that Bib it lao is a distinct species are open and reconsideration I place my results before the public. My experiments show that at any rate, the lac which grows on the Babul tree is not essentially distinct from that growing on the bor or on the situplat. I may note in passing that the mother-lac I used for situplat was from Bor and abtained from Pass.

The geneological table of my experiments would be thus tabulated.

Mother-lac from Box from Pass.



I do not give the complete list as the experiments are still in progress. Enough is given to elocidate the point in controversy. In the light of my experience and experiments Babut trees have been incontacted in two places at Saswad and three places in Taleganm Dhamthere, Poona District.

Surat .- Here we were accommodated in the travellers' Bauglow by the side of the river Tapti, and the Government Farm extending over 200 acres was hard by. On this there are many series of experiments. The first of these to notice was designed to ascertain the comparative value of manures-artificial as well as natural and the exceptional position as to value possessed by cattle and other furmyard manure was quickly evident. Another experiment was designed to test the effects on the soil of Night soil and Pondrette, and the marvellous effect o. both was obvious. The latter was however distinctly inferior to the former. All the experiments were brantfully carried out. In the exeming we were shown the Gmerat method of straight so ving practically, but we were disappoint d wit the skill deplaced. The next morning we went to see the very hig a cult vitio, of gurlen crops in the neighbourhood in lands owned by a provate gentle and who let is an least enormous profit from this type of agriculture. Here we were given a tea party by the past stalents-Messrs. Putel, Naik and Shokla.

Songhad.—We were here as guests of the Birola State. In the morning as soon as we were up, we started to see the fort. This fort being situated 1600 feet above see level and the extreme sterpless and the abrupt winding made it quite impossible to go to the top of the hill without any balt on the way. On coming dawn we proceeded to the farm attacked to the Bhil school here. This farm is conducted as a guantine farm run on economic lines, and is conducted very ably by the boys themselves under the supervision of the careful Henlmaster. We could well see there how Bajri crop sown early was spoiled by the incoming early rains at the flowering time. The Director of Agriculture of Barods, Mr. Shitole, took great pains to show us everything.

We left Soughed for the station Northern and thence from Northeau to Dullin we had a very tiresome poursey of 24 miles, but that gave us the opportunity of seeing both sides of the road—the disastrons condition due to the excessive drought of the pre-ent year.

Divilia.—Here we had nothing to see on the farm except one or two cotton crosses as the failure of rain has been so complete as to destroy practically everything. Only four inches of rain had fallen since May, as against an average of twenty two inches. We could clearly see what the miserable condition of the cultivators of that district will be during the coming months. Ahmednagar.—On the morning after our arrival we were taken to the plots where the experiments of dry-farming are being conducted under Mr. Knight's supervision. The experiments in timely conservation of moisture, in excelled cleun entiretation, and in seasonal sowing versus randfall cowing, are worthy of being visited by way of instruction by the cultivators round about. In the evening we went to Mr. Cur-setge's garden to see the cultivation of Ganja and fruit trees. While returning we were called to a tea party by Mr. Kathawate B. Ag. There we had an interesting talk with his father—a retired sulpedge who expressed no that occasion that B. Ags. should try to bring their knowledge to an advantageously practical use—there being a vast field open for them to undortake many enterprises. He odded that if Government be willing to give out lands lately deforested on some conditions for cultivation, his own soo would be the first man to go in for that.

Here ended our tour in the Northern part and after returning to Pooca, we started again for Southern Maratha Country.

Hulcre Read.—The Gokuk farm was visited by os in the morning. There were some few experiments on this farm. Two of these we particularly noticed. One was no oftempt at reclaiming some plots on the farm (which were totally out of cultivation by the profuse occurstation of saits) by laying out drains. The other was an experiment in the cultivation of Cumbolin cotton to get the largest yield. It seemed to show that this farm is an eikel place for the growth of this cotton.

While leaving the Gokak station we were given a hasty party by the Members of the Gokak Agriculturul Associations.

Belgaum.—The Government Farm here is very small, and the only experiment was one on the thick sowing of potatoes. Here higs were tried and proved successful to prevent the drimage from ricegrass-hoppers. Here Messrs. Nazare and Kangle gave as a grand tennarty.

 $\mathit{Hubl}_1$ .—We did nothing here practically except that we took a morning stroll round about the fields near by to see the queer mixtures and the clean cultivation in the fields. The great damage done  $\mathbf{t}_0$  jcwar, by the grass-hopper was very evident here. They were found living in the leaf sheaths and had no wings.

We were here cottertained to tea by the Liegayet community.

Dharwar .- The chief object of interest here was the Government form extending over an area of two hankel acres. Mr. Rande, the Superintendent took us round the whole firm and explained to us the experiments. These were very namenous. Annual them was a series conducted in order to ascertain the comparative value of various different mannes, very similar to one lad out outhe Strat farm; another was designed to show the ingredients specially wanting in black soils and so on. All the experiments were conducted very ably. The cultivation was clean althrough. Plots were remarkably straightsown. On this farm we saw one ballock who was reported to have drawn quite alone, nnaided, thirty two loads of san and kulthe. From the photo given in this number it can be clearly seen what a magnificent animal he is. A pair (this ballock and some other) was bought three years ago for Rs. 335 hat this ballock of above desemption is at pre-ent asked in the market for Rs. 300. His very large body, huge limbs and his appearance have a great similarity to those of a hallock of the Krishna valley breed, but the borns are quite different. The actual measurments of this bullock are as follows :-

o t	Height Heig over behind the the hump hum		ined ined			of	Learth Learth of the body borns		Leazth of the face		Brendth of the face		Breadth of the forehead		Lenzth of the ear		
ft	13. 5}	ft.	10. 7	ít 7	10. 1	ft.	2	ft.	10 4	. tr	tn 1	ft:	3	ft	ın 10}	ft 0	ın 11

Afterwards Mr. Shevade lectured on cotton improvement, its possibility and the methods by which it can be brought about. Broadly he gave us three ways: 1 Introduction of new varieties. 2 Selection and 3 Hybridisation. He told us that by crossing two varieties of Kump'a he succeeded in improving its guning per cent. and colour. Our hosts on the farm kindly gave us a tea party before leaving. We met our F. Ag. friends here and a grand cosmopolitan dinner was arranged which was graced by Dr. Mann and Prof. Knight.

We left Dharwar for Marmagon and on our way to it we had a view of some of the most beautiful and picture-que scenery in the Western Ghats. To give a clear and adequate idea of the plateaux and hills covered densely all over, by the beautiful green fore-its and the beautiful pellucid streams and rivulets running down them would be beyond my power. On reaching Marmagoo we sailed off the channel to Punjim.

The journey from Puntim on to Batnagiri was more of a touring than of instructive nature.

We halted at Punjim for two to three hours. During that time we took a round about the city. The capital is elegant and finely built, and has got specious and clean roads; the city-buildings are just after the style of Bombay. While leaving a pleasant tea party was given to us by Messrs. Habu, Naik and Gokarn.

At 10 p. m. from here we launched for Ratusgiri.

Thus the final point of our tour was specially employed, as would be expected, in studying the rice crops and others of local interest. In particular we went to Mr. Joshi's well-known mango gardens where ne were shown the mange grafts both simple and by approach-for which he is famed. This is, of course, one of the centres for the best mangoes in India. Mr. Joshi very kindly entertained as to tea.

This was our last stopping place. After a rough and unpleasant voyage we reached Bombay on the following day, and so back to Poons,

## The Geological Tour of the F. Ag. Students

#### G. D. Gupta.

" & am a part of all that I have seen." As the day arrived appointd ed for our tour, the happiest and most instructive item of the first year course, our eagerness grew stronger and stronger, so much so, that, without the least exaggeration, I may say that even the Land of Not though most alluring, bad lost all its charms to many of us for the night previous to our departure.

Only a word as to the 'why ' about such tours. We might have some through the most visid and accurate description. We might have perel over virious maps pictures and plans. Yet reality gives us a vew rupression and vinew knowledge hardly obtainable otherwise. this is specially true in the case of Science of Geology, which, indeed, er; hardly be learned in any other way.

i, the present year, we lett Poon in the early morning of October 9th. The route taken by us, and the places visited were almost the same as in previous years. As new-comers have always something

novel to tell and open fresh channels of observation or reflection, I have, andertaken the task of giving a very brief account of our experiences during the fortnight when we were absent from headquarters,

Our first halt was at Gokak road where we arrived on the evening of our started day. On the following morning, after the arrival of our Principal, who as usual led as throughout, we started on our mission. Examining the sedimentry rocks, filling our bags with conglomerates, andstones, grit etc. etc., we heared the famous Falls of Gokak. I fail to find words for describing the boardy of this place adequately. It is interesting to note in this connection, that the proprietors of the spinning and weaving Mills situated very near the Falls, are thinking of nulising the falls for the purpose of generating electric power to drive their mills. On our way back to our station quarters, we were entertained at a tea party by some of the members of the staff of those mills, for which our succere thanks are due.

The day following we spent in Belganm. There the chief rocks examined were high level laterite, and a number of peculiar conformations of the Decean trap. It would not be out of place if I mention that at night on the station, we had the pleasure of seeing a very smart Indian hoy of 8, speaking four different languages, including English, which he spoke pretty well. In no time, the boy grow familiar with all of us, and Dr. Mann too. We wish every success to our young friend.

Next came Castlerock. We walked along the railway line from this place to Dudhsagar over bridges and through various tunnels, examining and collecting shales, schists, gueiss, etc. Here the trip was very laborious, yet most pleasing and instructive. One could not look over the woodeness scenery in the way, with its legion peaks high day, without naturally questioning, "who did all this colosal work?" Ont of a mere huge mass of earth who chisselled these mighty picturesque objects? Oh! The answer was at hand. Lo! The real sculptor the dynamic force, always young, ever fresh and vigorous was rising up the Eastern horison. It was he who raised the water up which excavated these rayines. It was he who gave gravity a plough to open out the valleys by plauting the glaciers on the mountain sides, and it was he who would ultimately roll nway these works of its own

creation, in the mighty arms of ocean. The terminus of that day's trip, Dudhsagar Falls, were arrived at mudday, where a soothing both and drink really served the purpose of "Dudh."

On the morning of October 13th we found ourselves at Londa. Here our trip wealong a stream, through a very thick thorny jungle. "In the free life, the fresh energy the sparkling transparence and merry music of smaller streams, there to something fascinating much more than the majestic grandeur of a river." No concealment, no melancholy there. Nature seemed to hold a never-ending festival and dance necommanued by the sunshine, shadow and ranning water.

The next place of inspection was Dharwar, where we saw only the Government farm. Here we had unother entertainment by the Farm staff. The following-Sanday-was also passed here, where we enjoyed our well-earned rest. A grand feast was arranged, as our friends, the B. Ag. students, then on their Agricultural Tonr, were also in Dharwar that day. Dr. Mann, Prof. Knight, Messrs. Gokhale and Sahasrabuddhe were present at the dinner arranged in honour of the occasion. Can it he a matter of little satisfaction to see the Indian youths, from all communities, brought up in the most various environments, taking dinner in the same place, with their Mohammedan, Christian and Parsec friends. In the evening a lecture on " What has the Agricultural Department done during last 10 years," was delivered by Dr. Mann in the High School Hall. One Principal, in dealing with his subject in his usual masterly style remarked that he would think college successful, only when its graduates shall labour, through thick and thin, day and night, to further the cause of improved agriculture, otherwise the college is nothing but failure. magnificent piece of advice !

Gadag was arrived on 16th October morning. This was one of the most important places we inspected, from a Geological point of view. Limestones, sandstones, slale, quartz, guelsa, schists, of various types were profinely collected.

At Ragalkot, like our last year's friends, we had to cross the river Ghataprabhe, in a strange sort of beat, a big basket with leather brimming all road. Geologically this day was af very great interest, the conglomentic quartiites being very fine indeed, while we came across in an adjoining village the only large area of limestone seen during our tour. Our last stay was at Bijpur, the city of untiquarian interest. Here we were again on the Decem trap area, and certain peculiarities showed themselves. In particular the marked development of calcite was noticed. In the aftermon we went round the historic city. Among other things we saw the Bol Gumbat, a wonderful piece of architecture, Jumma Mayed, Ashar Mabdl, Brahim Roca etc. as well as the Mulkannadidu gun, the dread of its times, which was lying resting in a corner of the ruined city wall along with hor two sisters.

The night of 19th. Really a might worth recording and remembering. It was beautiful calm night shrould hy a canopy of darkness, when we all assembled to sing, dunce and engoy, under the leadership of our Principal. Be it known, to add to the various wild ways of nature, magnificent highting was flashing "between gloom and glory." Every one of its was bound to sing, recite, dance or lecture. And why not? Who would not sing?

- "That man that bath no music in bimself,
- " Nor is not moved with concord of sweet sound,
- " Is fit for treasons, stratagems, and spoils."

Dr. Manntsong "sweet home" and Frof. Sabasmbuddho's Gujenti song will never be obliterate I from our memories. Dr. Mann, then, gave a fartly long lecture, full of meaning, advice and affection he feels for us.

Now the time for return came. A thorough love and true enjoyement of the journey does not by any means interfere with the love and charms of home. "Perbays no one can enjoy thoroughly bome, who does not sometimes wander away. They are like exertion and rest each the complement of other."

I would be guilty of gross mistake if I forget the troubles, which Dr. Maun and Prof. Sabasrabuddhe took merely for our sake. Both of them accompanied as wherever we went, in whatever we did, throughout the tour. On behilf of all my fellow brethren I tender our most sincere and grateful thanks to thom.

#### Mr. G D. Mehta.

Dayshankar Metha, I. Ag., (Bombry University), R. A. (Cantah), N. D. A., N. D. D., an his admission into the Imperial Indian Agracultural service. We cannot allow this occasion to pres without giving to our readers a short sketch of Mr. Mehta's life as he is the first graduate from an Indian agricultural college to be admitted note the Imperial service.

Mr. Gaupatlal Mehra was born in a wealthy sawfar family in May 1883, at Umreth, in the Kheda District of Guigerat. He completed his primary education at Natival. After passing his Previous Examination in 1901 he joined the Agricultural Branch of the College of Science in the beginning of 1902, and passed the L. Ag. Examination in the first class in 1904. He was the first student who obtained the first class in the L. Ag. Examination. In 1905 he abtained the Sir Mangaldas Natinabhai scholarship of the Bornhay Government und proceeded to England to study Agriculture and specialise in Agricultural Chemistry. While in England he had a four years' course in Agriculture and Science at the Cambridge University and observable Opinional Produce University and took the following Diplomas:

Agricultural Diploma in 1906.
National Diploma of Agriculture in 1907.
National Diploma of Durring in 1908.
National Diploma of Durring in 1908.
National Diploma of Durring in 1908.
First Class Honours with a Gold Medal in 1909—the highest distinction obtainable by a student in Chemistry at that University.

University.

He also visited various seed stations in the United Kingdom and on the Continent, and made a special study of seed testing and seed selection.

When herefuned to fuline in Segtember 1995, the Governmentoffered him a position in the Bombay Agricultural Department and recommended his name to the Government of India for admission into the Imperial service. Mr. Bichta'e career both in India and at Cambridge has been a brilliant one, and we must congratulate the Government in having secured his services in a wider field than the Bombay Presidency alone offers.



Mr. G. D. Mehia L. Ag., B A., N. D. D; N D. A.

## College News and Notes.

The present number of our Migazine issued on New Year's Day carries with it to our staff, fellow-turlents, and to all our subscribers our very sincere greetings and best wishes for a Happy New year. We trust the New Year will be one in which Heaven's blessings await us all.

To us, the students of the College, the New Year is a herald promaining from the house tops the decree. "The ecuminations approach. Be ap and doing and ready for the fight." Indeed, to us the University examinations are all important in the first few months of the New Year. We hope that all our efforts in the old year will be crovaed with success in the New and that we shall have the pleasare of seeing ourselves nearer the goal towards which we are striving.

For the Agricultural Department, we pray that the New Year may be more prosperous than the past; that Nature may ever wear a most radiant smile; and that our barns may be so filled with ple by that the delight horn of hearty satisfaction and joy at nature's grace and hounty may be reflected in the coantennace of every member of the department.

The most interesting item conceed at the College during the Inst quarter was the South Guthering held on the Ord of November which brought us—staff, stadents and ex-stadents all together, to enjoy in each other's genial company a assful and pleus at hollary.

The day was ashered in by the anspictors sonnling of the "chowghada;" and well might the "chowghada" be called auspicious, for nothing whitever chanced to distorb the exquisite harmony of the day's proceedings. Even the heavens which a few weeks after hore ominous clouds, seemed to look kindly on our gricty added to it by lending as bright sunshine and excellent weather.

Hence, the photo, the tennis match, and the various sports and games which formed the programme for the day were a decided success. Mr. Keatinge, our Director, before distributing the prizes and medals to the several champions in the sports, addressed the assembly on the occasion in a very felicitous speech brimming with friendly and instructive advice. Dr. Mann had also a few words of advice to give, in his name doquent and effective style.

After the address which was at 4-30 p. m. we had an exciting time it Tag-of-War before algorating to puttake of refer-henets. The S.Ag. men seem to be a powerful lot, though many appear to be otherwise; they pulled over the F. Ags. and the B. Ags. Their prowess however fulled before the mighty strength of the staff, which, mighty in the lecture room, also vinducted it is supremey on the playground.

And here we might congraintate ourselves and feel proud of the intimate understanding between the professors of our college and its students. We doubt not that this makes us know and love each other more than anything clse would. And we thank most sincerely all the members of the staff for conducing, not only by their presence but by their active interest in all items of the day, to the eminent success of our rathering.

We must also not forget the ex-sindents, some of whom came a long way to join us and others by their messages expressed their appreciation of which success to our undertaking. To all of them we give heavy thanks for their co-operation.

At 8-30 p. m. commenced the variety entertainment. It opened with a fine march rendered by the orchestra composed of budding unsticans from among the students and a few young men who did us the honour of strengthening our own band of musicians and to whom our best thanks are due for their charming performance on the violin and mandoline. The Nugger Ministrels, the Goperati drams "Karma", the English furce "Cherry Boance" and the Marathi Drama "Premathway" rendering of the "Talsman" all helped to keep as Brety and occasionally also serone. It was rather long after midnight before Dr. Mann rose to thank all concerned for the admirable arrangements that were made to bring about such a successful gathering and even then the stage clown seemed to be loth to allow the assembly to bretk up.

To Mr. V. N. Gokhale, the general secretary, and to all his under-secretaries we offer our hearty thanks and congratulations for all ther did to enable us to have a most enjoyable gathering. of eight lakks of rupees. A large part of this donation is to go for vernocular agricultural education which we trust will soon apread by the opening of new vernacular agricultural schools.

We have great pleasure in tracking the manager of the Peccan Punting Works for presenting to our College, a portmit of their Majesties The picture is quite building and as for its price of nunes three it is very chean.

The weather in November was unusually peculiar. The heavy rains towards the latter end of the month bore the appearance of a second monsoon. Though natimely and not of advantage to crops in flower, this rain has helped to soften the soil, do good to young dry crops, and improve the very short fodder sapply.

The students have been away for the Christmas vacation while our pages were in press. We hope they have had a good time and will return fresh for the hard task before them.

We have much pleasure in noting the success in the recent B. Seexamination of Mr. R. B. Yaidya a past graduate of our College; we wish him joy on his obtaining a new degree, and success in his work as succeed and nature study teacher in Berny.

We have pleasure in also recording that another of our past graduates, Mr. Maganial Gokubbai Desai, is to be shortly sent to England by H. H. the Gaikwad's government for special training in bortuculture. We wish every success to him during his stay in the West.

## The College Gymkhana.

Cricket has been at its ebb throughout the second term. Some entunists recently memoralised the secretary and requested him to give facilities for daily practice at the nets. But though the secretary offered to make the necessary arrangement the sudden enthusiasm seems to have waned owing to the prospect of the examinations.

The Tennis secretary has had a lively time the past quarter, if the arranging of tournaments and settling the thousand and one knots that arise in consequence really deserve the nums. He was indeed kept very huny particularly owing to the tournaments in connection with the Social Gathering. As Mr. Modak the veteran tenus champion decided not to play, there was room for others to shime in the tournament. The names of the several champions are given below.

The existence of only a single court creates many difficulties as most of the students like to in luige in the game. We would wish very much that the court on the college grounds be opened as soon as possible to facilitate matters.

Hockey still holds the lead and practices are often held. The last match played was on the 22nd of December against the Young Parsees. We lost it, hat we are still younger in the game than the Young Parsees.

The Gymnasinm has its usual patrons.

The Reading Room is well patronised particularly between lecture boars. The boy however seems to have a knack of removing the 'atest periodicals and retaining the allest. He would do well to receive naturations from the secretary for maintaining better order in the arrangement of papers and periodicals.

The Debating Society has had to cancel several lectures owing to the many holidays. We had still some very interesting papers by the Baras, Mr. R. K. Desai and Mr. C. V. Sane on Grape-Vine, Ginger, and Improvement of Indian Cattle respectively.

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#### THE AGRICULTURAL COLLEGE MAGAZINE. PRIZEMEN FOR 1911. Champion Sportsman ... Mr. R. D'Souza.

...

••• ... JUNIOR DOUPLES.

JUNIOR SINGLES.

... Mr. S. Allabux.

... Mr. H. K. Bendigiri.

... Mr. S. R. Godbole.

... Mr. S. R. Godbole. Mr. N. R. Gurjar.

... Mr. B. S. Patel.

Mr. C. M. Mugali.

			CRIC	KET.	
Batting			•••	***	Mr. S. B. Deshpande.
Bowling	***	•••	•••	***	Mr. N. R. Gurjar.

TENNIS.

SENIOR SINCIPAL ... Mr. H. K. Bendigiri.

...

First champion ... ... SENIOR DOUPLES.

Second champion

...

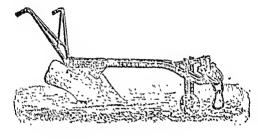
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## POONA AGRICULTURAL COLLEGE MAGAZINU

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. The Magazine is at the disposal of Professors, past and present students to well as outsiders having as ocial interest in Agriculture. All contributions should be written legsbly and on one side of the paper and are subject to such needful emendations as may be consistent with their sdees and rejected articles will not be returned.

The Magazine will be published as follows :-- 1st July, 1st October, -1s January, 1st March and contributors are requested to send in their contributions at least one month before the date of publication,

B. S. PATEL Editor.

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taired on application.

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# POONA AGRICULTURAL COLLEGE MAGAZINE.



### POONA:

PARTIED AT THE "ARTA-ENGEGRAP" FRESS, AND PUBLISHED AT POOTA

By

Vishnu Narayan Gokhala.

1912.

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DIGAMBAR NARAYAN GODSE, Budhwar Peth, Poona City.

# A Grand Prize Rs. 500

# FOR AN IMPROVED SEED-DRILL.

# Dr. H. H. Mann,

Principal, Agricultural College, Poons.

(i) OW do you expect a good crop when the seed is sown naphazardij with a seed-drill, however thoroughly the land is pregared or manured?

Best Results can not be obtained by only good sound seeds of begerminating power and free from any almixture, but by dropping the seed with a seed-drill which distributes the seed evenly and uniformly.

Such conditions are not obtained in any treet of this Pre-ideary In Gajerath the sowing is straight in most of the tracts, but the uniform distribution of seed is seldom met with. A close inspection of the sown fields immediately after germination will reveal not less than twenty per cent. of the sown area in blank, without a large cealing. This state of things must certainly affect the out-ture. This might be due to defective seed or seed-drill. However expert a sower might be, it can near to expected that seeds will be dropped so regularly and evenly as by a machine. Being frequently strock with the pre-cent wateful method of sowing Dr., Mann has kindly offered a Price of Rs., 500 for an improved seed-drill.

The prize is to be awarded under the following conditions:-

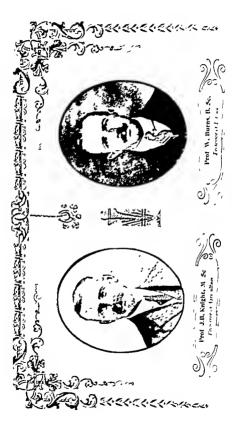
- 1. The price of the seed-drill should 7. not exceed Rs. 50, the less the better.
- The drill should automatically sow the seed at regular infervals in and between the lines.
   The blenks left by the drift.
- should not exceed five per cent.

  4. The seed drill should be suitable
- for all kinds of soils.

  3. The drill must be able to sow
- unall as well as large useds.

  6. The model seed drill should be a
- full sized one suitable for work ing in the fields.
- The drils will be tested by a Committee consisting of Mr. P. C. Patil, Divisional Inspector of Agriculture C. D., Mr. M. Exhaura, Divisional Inspector of Agriculture S. D., and Rio Sabel G. K. Kelhar, Assistant Pro. of Agriculture. The Committee may consuit Prol. Knight and Mr. Mails, il necessary.
- 5. The models of drills will be received by the Principal, Agricultural College, Poons, to the end of May 1912. In case dulls of almilar patiera are received from more than use person preference will be given to the une that is lirst received.

All communications to be sent to the Principal. Agricultural College,



# The Poona Agricultural College Magazine.

# Editorial.

Tiffle present numbers are larged the state is obtained of the Poena Magnetium of College Magnet and region in with an expression of very graticule to all who have a control to make the best column which has yet from produced. If a large count order of the proteoms ones; in outside with the proteoms ones; in outside with the found on the whole of quite to the actual of the actual will be found on the whole of quite to the actual of the control of the college of regularly not only to Regularly for all of the counts of the other and America. The effort, in laying down their drops, would thank all the members of the onlings staff, and of the cut of the agendianal department, as well as post similarly, sin leads and outsides for their very learny co-operation in making the Magnetic the salores it has been during the put year.

In the present number will be found everal actueles of convolerable interest. We would in the first place call attention to the actuels by fir. S. D. Navilkar on the reclamation of lands, under high title water on the West court of India. The matter is an important one; much money has been spent in reviging ones mangrose covered land on the West court; many failures have been much and a few successes. The actual court of a successful instance of this work, with the accounts for the same, is bound to be of value, and of great interest.

We commond also to the notice of our moders, the article by Mr. G. D. Milta on Scothesing, marminch as the author is an expert on the subject, and has been applying his knowledge during the hot three years to the study of the actual scot conditions in our province. His results are striking in two directions. The seed need by the cultivators is not nearly so tail as many writers have made out, except in the case of

cotion. Cotton seal is, however, worse than anyone would have even thand to predict, and its present condition would certainly seem to domand very serious thought and action on the part of those in a position to remedy the actual state of affairs. On the other hand, the seed of most crops is not nearly as good as it might be or as it ought to be.

There are many special kinds of cultivation in the Bombay Presidency about which little information is on record, and any detailed description from local knowledge is of great value. We have published articles on some of these in the past. The growth of 'Betel-ine' in several centre has been described in our columns; the method of producing the dried plantains at Agashi in the Thana District has been treated of, and there are several other caves. In the present number two such articles are given. One, by Mr. R. K. Desii, whose home is near the spot which he describes, is on Lindi piper (Piper longum) cultivation as practised in the Surat district; the other by Mr. R. D. Klandekyr, is on ganja cultivation, that is to say hemp cultivation for the production of the intovicating drug, were the town of Ahmedingar. Doth of these will be found of innor then or than or the same of the count of the

It may be worth white also to call attention to Dr. Mann's article on the unanticture of agricultural implements in Western Indus. This was originally written for one of the Bombry Engineering papers, and contains a short account of the works which have been successfully established and developed by Messrs. Kirloskar Dros at Kandal Road (S. M. Ry ) for the manufacture of agricultural implements, especially chaff enters, plonghs, and similar things. We hope that the works described by Dr. Mans will develope enormously in the coming years, and that they will be the proncers of a very successful manufacture of improved implements in this part of the country.

And now we send forth the last part of the third volume of our Magazine. When it issues from the press many of the college students will be away, the college will have broken up for a time, and another college year will be over. Many among the students will have left the doors of the institution, as students, for ever; we hope that this will not prevent them thinking of it as then alma mater and visiting it whenever they are near enough to do so. They are always assured of a hearty welcome. Our students only belong to us the more when their college days are over. It belongs to them to carry the college spirit into every corner of Inda. So may it be.

# The Department of Agriculture of Bombay During the Last Ten Years

BΥ

# S. V. Negarkar,

DRARWAE.

[ The following note written by a friend at Dharwar will, we believe, interest our readers—Eds. ]

been having his annual tour through Sauthern Maratha Country. In his tour he was accompanied by forty-one of his pupils. The object of this tour is to give the these pupils a close and minimate knu rlvigo of the construction, nature and the properties of the various kinds of rocks, stanes and soils of these parts of the construction has passed through Dharwar with a similar batch of students. This year he had ulready visited Belgaum, Loudha, Castlerock; and from Dharwar he proceeds to Hubli, Gaitag, Bijapur and other points. As last year during his brief stay he delivered a most interesting address on the evening of Sunday the 15th Ootober 1011 in the ball of the local Government High School the topic of the address being "The work of the Bombay Agricultural Department during the last ten years." The address was presided over by the Collector of Dharwar, Mr. E. Maconochie, and attended by quite a representative gathering of the etizions of Dharwar.

Dr. Mann, in substance, and that within the last decade the conditions of agriculture in Index head undergone, he could not easy radical changes, but he could cert only say considerable changes at least in Bombay Presidency. These changes were as significant in themselves as they were prophetic of the still greater changes that are to follow. It was strange that in a country like India where 80 %, of the population were dependent for their daily hing on agricultural parsuits, agriculture and agriculturists should have been considered some thirty years ago, as they are even to-day in some quarters, as being below the dignity of a gentleman either to follow or to associate with. This frame of the popular mind in this country received its

first rude shock in this part of India perhaps in the great samne of 1877 when the eyes of both the Government and the people were directly as a certaining the cause of and a serting the evils arising from that widespread calamity. It required long and deep thought on the part of the Government to device ways and means, even if tentative, for the purpose of improving the condition of Indian agriculture and Indian agriculture. When the Government came to apply these ways and means in a practical way to the solution of great problem it had to face several very great difficulties. The chief of these difficulties were (1) lock of interest, (2) lack of knowledge and (3) lack of means of the control of the control of the control of the control tests were (1) lock of interest, (2) lack of knowledge and (3) lack of means of the control of the

- (1) By hel of interest is meant the fact that the really intelligent and thoughtful people did not, and would not take any the least interest in agriculture. They were confirmed in their rolld belief that ploughing and farming were concerns of the ignorant ryot and that ther as superior beings were in no way concerned with them.
- (2) By lack of knowledge is meant that under the conditions prevalent, one part of a District did not know and did not care to know anything of the mode, and methods of farming that were being followed in another part of the same district, and still more of the improvements which had been devised either in or out of India. Furthermore, the lest methods meeting the existing special difficulties were quite unknown even to the best cultivators any where, and demanded experiments long continued in order to find them.
- (4) By lack of men is meant that at that time there were no educated men who would be willing to devote themselves to the work of improving agriculture of the country. The people of the so-called higher classes in this country lave a borror of all manual labour and the greatest borror of a close and direct contact with anything like the soil in the fields and the med in the mines.

At this point in his address Dr. Mann said that if any one asked him as to what had been done by the Agricultural Department to remove these nutoward conditions he was not in a position to claim that much had been done. All the came no one could deny that a beginning had been made and that at least a little had been accomplished. That the lack of interest was passing away, though not as fast as one would with, was evident from the class of people that had taken the totable of coming to hear him in a purple agricultural subject. It was a matter of unfeigned satisfaction to him to notice among his hearers that 'evening quite a number of lawyers, doctors, schoolmasters and merchants; and he sincerely believed that not a few of them had come there to hear him from a genuine love of the subject. This same public interest has been materially stimulated by the establishment of Agricultural Associations and Cooperative Credit Societies in different parts of the Presidency by the starting and unintaining of monthly inagraines and by the distribution of leadies and other literature devoted to various topies in connection with agriculture.

Coming to the second question of the lack of knowledge, the lecturer said that mere interest without knowledge would be next to useless. With a view to acquire such a knowledge would be next to useless, the second of the second that the second of the residential that been buy in intestigating the nature of the soils of different districts and the methods followed in the growing of the different crops in various districts of the Presidency. It is of the ultracet unportance to find out first of all whether the method followed in the growing of any one particular crop in one Taluka, On impury it has often been found that such a method followed in one area is used no where else, or if it is followed in another place, this is done without any attempt to adapt it to the new conditions.

Dr. Manu said that it was principally for the purpose of aronsing such an laterest in the minds of the people in general and of the agricultrists in particular that Government had established its own Patnas in several Districts. Such farms are often called "Model Farms". Perscally he had the strongest possible distils to the term 'Middel Farms' he would rather call them experimental farms. For after all what the Agricultural Department was trying to do through these farms was to find out what was the best thing to do. Was it the best to try to raise such and such a crop in such and such a soil? If not what other crop would be suitable? And, in any case, how could it best to done,—and most profitably? These and similar questions they were trying to solve on Government Farms. They were trying to find out what was the best thing to do to-day. Next year or ten years hence under the light of new discoveries and new investigations the same thing may not be the best.

Given a particular kind of soil on these experimental farms it was tested and found out as to what kind of crop would grow most profitably in such a soil and under such conditions. The soil round about Dharwar, Habli and Hankapar for in-tance, is well suited for the cultivation of Broach cotton and therefore that particular kind is recommended to be grown in these parts. Within the last two years this cotton crop brought fifty thowsand rupces extra to the cultivators of cotton in these Talakus. People often asked why Lightian cotton was not grown. They might past as well not why Sea Island cotton was not grown. The acouser to each questions is simple and plain. These varieties are not grown semply because they cannot be grown in these parts, and the Government fargu at Dharwar has proved it.

Speaking of the lack of men Dr. Mann said that as in every field of from in the improvement and alreacement of Indian agriculture also there is great need of the right kind of men—men of claracter, men of self-demal and men of depotion to dety. Hen of ordinary official type who go through their daily routine of duties would not be of any nes in the agricultural department. Here a man must be endowed and inhined with deep enthusivism and must be prepared to take up agriculture as his life work. The lecturer pointed Mr. M. L. Kulkarni the present Dissional Inspector of Agriculture as a man of marked levotion to his vocation, and raid that there were a few others also like Mr. Kulkarni in the Agricultural Department. But, all the same, more of this type were still needed. More than in any other Department, it is in this one that workers have to learn ever to be disappointed. They have also to learn low to be potient under very hitter and sever criticism.

After this the lecturer went on to explain what has been accomplished by the Agricultural Department within the last 10 years. What were the improvements introduced. These perhaps were not many. But it is the first etep that coulds and is the biggest. The second is comparatively casy. Speaking of the Dharwar District so well noted for its cotton cultivation the lecturer stil that Agricultura Department had not only demonstrated the possibility of growing Broach cotton in the black soil of this District, but it had won a permanent popularity to this particular species of cotton that possesses decidedly a larger gunning percentage over the focal Kumpta cotton. Taking into consideration the fact that the Indian agriculturist is so deeply wode I to his old ways and ancient methods it is most gratifying to note that in the course of last year alone 50000 lbs. of Broach cotton seed was sold to the cotton cultivators of this district. And while all this was done

for the entside Breach cutton, the local variety of Kumpta cotton had not been neglected but, on the contrary, had been greatly improved.

Then again take the case of groundant. There was a fine when in these parts some 20,000 acres of land need to be under the cultivation of groundants. But some fifteen years ago the type was found to be rained by disease, and so the cultivation declared. Upon this, the argicultard department collected all the possible varieties of groundants, from various parts of India, and also from Spain, Japan and Egypf and from these relected a new type. And at this date in the belgamm and Satara Districts as well as in the states of ichalkarmij and Kollapur, the Spain-di and the Japan types of groundants are found to be flouriding, and their cultivation is rapidly extending. This is highly significant when one takes into consideration the fact that oil-scads of every kind are every year growing in value and are jouintful grow in value in the immediate future.

Then again espandly round about Poona, sugar-cane growing has been brought to such a perfection that it is all almost as good as anywhere in the world except perhaps in the Sandwich Isles in the North Pacific.

Speaking of the improvements effected in agricultural implements the lecturer raid, these improvements can never be over estimated. The myth that the old Indian plough was good enough simply because farmers had been working with it from the most ancient of times, has been more than exploied. If any one needs the proof of this be can interprete the facts for lumself and note that 2000 ploughs of a foreign make and reveral thousand manufactured by Messes. Kirloskar Bros. of Belgium on an improved plan have been rold. So also there is the new French gear plough lately imported which bills fair to find favour with Indian I and-owners. The same is true of the improved furnice for boiling sugar-case paice lately desired by Mr. P.C. Patil. Divisional Inspector of Agriculture, C. D. In the carly stage of his enterprise Mr. Patil was quite despendent of success but now to his own as well as to his customers' great gratification, there is a very great demand for his furnace in the paggery manufacturing district round Satara.

Dr. Mann said that one of the great needs in the way of implement in this part of India is an effective seed-drill that is, a machine for securing an even sowing of sec1. According to the method at present in vogno among farmers the sec1 is so unevently distributed in the field that in some places it is very thickly spread while in other places it is very thirdly scattered. What is needed is a machine that would enable the farmers to distribute the seed evenly in the seed furrows. Dr. Mann is prepared to award a prize of Rs. 500 to any one who would device such a mechanism, suited to the conditions of the Deccan and Southern Maratha Country.

It is a notorious fact that round about D-Iganm grass-hoppers are a great pest to rice crops in their very tender stage. These creature, have long been the despair of enterpolising rice cultivators. With a view to do away with this pest, the Agricultural Department has lately desired a kind of net which, if ewest over the puddy field, collects into itself vast swarms of grass hoppers that can ultimately be buried in a pit previously dag for them. It is only just to mantion that were it not for this device for the purpose of destroying grass-hoppers the pudly cultivators of B-Iganm would not in some years able to reap a crou of even two annas in the rupce.

The lecturer spoke for over an hour and a guarter, and was hearl with rapt attention. At the close of the lecture the President on behalf of the an lience heartily thanked the lecturer.

# Silage in Western India

...

W. Horn, Esq. Manager, Ceed Dairy, Poong.

TLAGE or Ensilage, is a preserved fodder, in which the succeleace or natural juices have been retained, and is prepared in put or "Silo".

The advantages of silage are many, the chief being : -

- 1. Palstability.
- 2. Succulence.

- It can be prepared during the rains when green fodder is plentiful and held over till the dry season, when green succellent fodder would be impossible except in irrigated tracts.
- It can be filled into pits without regard to weather conditions and at times when the drying of grass or kadbi is impossible.
- Coarse grasses and weeds which would be refused in their natural state are eaten readily if made into silage.
- 6. After being pitted there is no danger from fire etc. us is the case with dry fodder.
- It is most neefal to feed in the case of sudden nutbreaks
  of Enizootic diseases, when it is a splendid alterative.
- The cost of production is cheaper than that of dry folder and the wastage less in proportion.

Silage can be prepared from almost any green plant, but the quality of the folder taken out must depend upon that put in, and although weeds etc. which is their natural state are refused by cattle, may be even greedily eaten, after being converted into silage, they are still weeds and have not grined in feeling value, but have simply been made palatable.

The crops usually selected for silage are: Maizo, jowers (of the non-sacchatine varieties), grass, wheat, burley, cats, Incerne &c. Of these Maizo is undoubtedly the best, and it should be noted, that under ordinary conditions, all plants which have a hollow stem are not very united for the "soil". Sul o"

There are two chief classes of silage z.z. "Sweet silage ' and ' rour silage ' and the class which will be produced depends upon the state of maturity of the crop at the time of cutting. In the case of the crop being out too early while it is very immature and contains a high percentage of moisture, formentation will be excessive, large quantities of acid will be produced, and the silage will be sour, and sweet silage will be produced by using well matured crops for the silo.

"Sour silage" will also be produced by using the varieties of jowar containing a large quantity of sugar, as the sugar will under fermentation be converted to acid. It is therefore evident that jowars of

these varieties can be more profitably fed green, when the sugar (which is of high feeding value) will be utilized, while if put in the sile, this will be completely lost as the acid which will be produced, has hule feeding value.

The importance of selecting the right time for cutting, will be more noticeable in the case of maize, than with any other crop.

The time for cutting mains is when it has reached full maturity, as hemical analysis shows that it almost doubles in feeding value, between till growth (tassellad) and maturity. So it is very evilent that to at 19 force maturity means a heavy loss, further, the maire plant in its artier stages contains a high percentage of sugar which as the plant intures, becomes gradually changed to starch, until at the time it has eached maturity the sugar has practically disappeared. It is therefore vident, that it is of the greatest importance to only put mature mains not the sile, as if immature marke is put, in the sugar is lost, while fkept till mature the starch will remain unaffected by the fermentation due so f high feeding value. The following analysis of good mains oalings shows the starch under carbohydrates which it will be noted are very high and only require the addition of food rich in proteid to make a balanced ration.

The classes of silos are many viz. cement concrete, masonry, brick, wood etc. made in many shapes and sixe, or the silo may simply be a hole dug in the ground in which the folder is baried by covering it with the arth removed from the hole. Whatever may be the co. struction or style, the object is the same, viz., to get the folder into a compact mass, and after it is once filled, to rigidly exclude air and moisture. This result is best obtained by using a circular shaped 'silo' of good depth, say 33 feet or more, the sides of which should be perfectly perpendicular and smooth. The material used in construction is a matter of locality and economy, as the silage will not be influenced by it. Good silage can also be made by burying the tolder in a pit dug in the ground which has the advantage of costing nothing for construction, but of course, there will be a rather large amount or wastage by this

method, as so much folder will come in contact with the curth and be spoiled. It is also not possible to chaff the folder into such a pit, as can be done in the case of a public boilt silo. In spite of its disadvantages however, this is the system which will most probably be adopted in India, owing to its low initial cost, riz. Rs. 5 to 10 according to cost of labour for digging.

The size of the pit will be governed by the quantity of folder available and the number of cittle to be fit, but in actual practice it has been found that a pit 30 feet long, 12 feet wide and 6 feet deep is most convenient when other conditions will admit of this size being use I.

The site selected for the pit should be the highest portion of the field to prevent the percolution of witer, and while digging, the earth should be kept well away from the edges (say about three feet) to prevent it from falling in the pit while the folder is being put in. When the folder is ready, cutting and pitting may be commenced without regard to the westlier as even heavy raise falling on the folder at this time will have no hall effect. The pit may be filled quickly or slowly as may be convenient, but care must be taken that the folder is well packed especially at the corners so as not to leave hollows for the accumulation of cir. Care should also be taken after the folder has come above the ground level, to keep the sides perfectly perpendicular, to allow it to settle evenly.

The filling should continue until the folder has reached the same height above the ground, as below the ground, which in a pit of the dimension here given, would he six fect above and six feet below ground. When this height is reached the top should be eloped off in the form of a ridge to shoot of the sain water, and then covering with earth may commence. This should be commenced from the bottom gradually building the earth up round the sides and ends autil the whole if occered and it should be noted that the whole of the earth removed from the pit, should be used in covering, as this will give the necessary pressure to make the slage settle compactly. After the covering is complete the mass will gradually settle until the top portion of the fill r is level with the goant has and during this process of sattling are must be taken to fill up all fishers or cracks, which would admit air or moisture, the admission of either of which would now cause

great loss. The top should be well sloped and a drain made round the pit to ensure all water being rapidly conveyed away from the immediate vicinity of the "silo."

The pit may be opened at any time the folder is required, and can be kept for years if necessary, which suggests a means of making a cheap provision of good fodder as a stand by in the care of folder famines. It is advisable to only open one end of the pit and to remove the contents straight to the bottom before removing more earth and this can be lest effected by cutting the silver out in solid blocks with a hav knife. Ruin falling on silege at this time will quickly make it unestable, and it should also be protected from the sun, in fact the best results will he obtained if the folder is taken straight from the pit to the cattle which are to consume it. This folder may be fed to all kinds of cuttle and sheep, except perhaps horses for which it does not appear to be suitable as it has a too stimulatively effect on their biduers. It may be fed feeely, but in the case of working bullocks or milking cows, it is advisable to give a little dry roughage in addition, say eight to ten pounds per head. Cittle nunsed to this folder may not take to it the first day or two and it should therefore be fed for a day or two in small quantities but after this period the cattle will eat it greedily.

In the case of milking cattle it will found to stimulate milk secretion, but should not be fed immediately before milking, as the milk quickly takes up ofours, and the particles of silage lying about would most likely invert their ofour to the milk.

A pit of the dimensions given viz. 30 feet, by 12 feet, by 6 feet would give an outturn of about 80,000 pounds of silage. The loss of converting green folder to silage will vary from 10 %, to 35 %, and will depend upon the stage of matarity of the crop, the class of sile, and the care exercise I in handling. Good "sweet silage" should be of n bright greenish-brown colong and bave a distinctive olong, which it is difficult to describe. Somewhat ges with nave a good values and with beat once recognised by its rank and cloud. Silage which has thorough careless handling, or the admission of air and moisture, gone had will be easily distinguished by its mouldy appearance and smell which is similar to that of rotting cow dung.

# Lindi Pipar (Pipar Longum) Cultivation Near Gandevi

ET

### R. K. Desai.

-----

THE intensive cultivation of long papper is one of the pactularities ties of certain villages in Gujarat, and a description of the methods adopted in one of the villages of the Surat District may not be without interest. As is well known the plant belongs to the natural order Piperneen; it is, like other commercial peppers, a vine, and is very closely related not only to ordinary pepper, but also to the betel vine (Pipar batel) or pan one of the characteristic garden crops of India.

Climitic conditions:—The temperature of Surat varies from 46° F. to 114° F. and the rillages in which this cultivation is carried on ano situated at a distance of twenty-five miles south of Surat City. The minfall varies from 40 to 50 inches, and almost all the rain-fulls between the tenth of June and the end of September. There is, in fact, only rain during the south-west monsoon and very little falls at other times of the year.

Soil conditions:—The lindi piper fruits, as has already been indicated, are borne on creepers. These creepers grow in Gorat and Bapayat soils very luxuriently, and moderately well in black soils. They do not grow in girayat and rice lands. The characteristic of the two first mentioned types of soil (Gorat and Bagayat) is that they are naturally well drained, have a very high degree of tilth and are very rich in plant food.

The creepers grow in places where tree shade is well developed. They are, thus found growing under the shades of mango and jack-fruit, but they do not grow under the shades of babul, tamarind and Mahuda trees. The creepers grow better in south aids of the trees than otherwise.

Preparatory tillage:-The soil is first cleared of vegetation and is then dag out to a depth of six inches with a hand-spade in the month of April to May. After this to further dupting econor, when a full of eight to ten inches of rain has control, the compets are planted out at the beginning of the month of August.

Meladici propagation-The compare are placed into shallow immus each about two makes deep make he a spain. The courses sings of the satt the fire become and covered with the little to be a said bed one land. Touce compete are preferrates allere. About fifteen hands entiatestic at the extension as we give an engine and for the plantation of one area. There pade ratio from Re. 4 to 5 per firty The figures. en gra a dra ball of the sal arima in-mail. When the museum to order to O tober, one material is given to the event the change for sted hilly rest all minite trainers. A french alle her which here fating from manery tree, or the dried learner of parameters are sported orn the conject. Any sect of learn may be med led there are the now are lette in their area. Then the meaner are here corrected through my winter and summer i. a. from Onober to May following. la samper, that is to ser in April and Aer a number of vicent places anger atte platel nime a I there are illed no with new treeper taken on althe executed new term by. Mann has all among taken place design the life which is, more proportions and the which are Arrest framely of the arrests, appearable of the execute hear and defined among all rese. If people over to taken in proceeding engine and warmer, the error planta to may evaluate the a long that is heldern does the courses retremed them the contrains have no need to for coregon to all up the gaps he and they oldain such as are normally than that own plantation.

At the end of May, that is to say, in Robini Nakshara, another watering is given and as a result, the energies put firth new shows just before the first observe of the innexion rate. Such congret are able to take the greatest advantage of the rate and grow with double vigour. The charges for this retainers are also Rs. 10. Watering is given from a will 00 to 07 for drop with a min having a copacity of uniquine gallows. Four Jays are required for retaining a copacity of uniquine gallows. Four Jays are required for retaining a copacity of

Werlag is not done very regularly with the copy

Daning the raine meanly, the half is would four times, the whole coming Res 5.

From the end of July or the beginning of Angust of the second year from the original statute of the Intly per guilar, the creepers begin to flower. In the beginning very small yel ow flowers are seen on each branch of the creeper. They are from seven to mine in number. Then from these yellow flowers, grewish yellow fruits are formel, and later on the latter become dark green in colour. The maximum length of a fruit is one inch and the minimum from one built to three quarters of an inch. When the fruits are dark green and fully maturel, they acquire a pringent and sweet taste which in licites the time for picking the fruits. All fruits are ready for picking at very nearly the same time and are generally packed together. The picking operation is performed by women, boys and guils, ten years old and upwards, with the hands.

A few fruits are usually obtained in the first year, very shortly after planting, if the raunfull is good.

The picking charges for forty pounds are four annas.

Outturn:—The outturn per acre varies according to the condition of the crop. In a first class crop the yield per acre is 250 lbs. (green weight). The moderate crop would give 1875 lbs. (green weight). The poor crop would amount to 1500 lbs. (green weight). The price for forty pounds of green weight varies from Rs. 3 to Rs. 8.

After-treatment of the Picked fruits: -From these finits two sorts of piper are made: (1) salt linds piper, (2) dry linds piper.

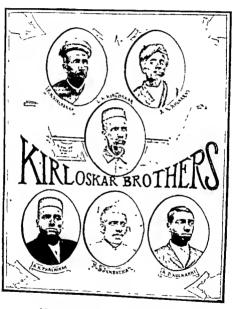
Preparation of sail Pipar:—When the fruits are picked and brought home, they are well-mixel with common salt in the proportion of 15 lbs. of common sait to 40 lbs. (green weight) of the fruits. Then after this, the mixture is put in an mon pan 4 to 5 feet high, 1 foot broad at the bottom and 3 feet broad at the month. It is generally open at the month. In this, the mixture of salt and trutts is kept for a week by which time pleuty of salt water is formed in the pan. After a week the pipar fruits are taken out and are dried completely in the san for one day. The fruits are often turned with the hand during the time of drying. When they are dried fally, the resulting product is salt pipar. Twenty-five pounds are produced from forty pounds of green fruits with fifteen pounds of salt, while at the same time much of the

sult water is left in the pun and can be used for another lot of fraits, and so on. The price for 40 lbs. of salt piper prepared as above is Rs. 13 to Rs. 15 but raties very much.

Preparation of dry land paper: The green pipers are dried for four days continuously in the sun and while drying they are tuned with the hunts. When they are fully dried, about eight pounds remain from the original forty pounds in green weight. The price of this sort of piper varies from Rs. 35 to Rs. 40 for forty pounds of dry weight, but this also is very varieble.

There the series of piper are then despetched to Dombay or Ahmedahal for sale. If the rates are very high, the brokers dealing with this business come down to the places of cultivation and purchase them in lots. The cultivators sell their product to local merchants at the rate of Rs. 5 to Rs. 8 for 40 lbs. of green weight because they being short capital, cannot afford to sell directly to outsile merchants. The local merchants prepare the two sorts as mentioned above. Those fruits are used as medicinal drugs and are next all over the country from Dombay and Abmedabad.

Remarks:—There is no doubt that this cultivation is n very profitable one. It requires no special and difficult treatment like praning at-Also at does not require manning. One peculiar thing about it is this, that the crop grows in waste lands under the trees where no other crop is taken, but some shade is pheolately remarked.



Mosses-Kirloskar Brothers,
Prominent members of the Firm,

# The Manufacture of Agricultural Implements in Western India

Harold H. Mann. D. Sc. Principal, Agricultural College. Poona.

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The present moment there is a little doubt that infter many years the spirit of progress has been roused in the ruml distructs in Western India, and one of the first directions in which this is manifested is that of a demand for agricultural implements of a more efficient type, capable of doing more work than those at present in use, and of saving some of the waste which now occurs I want, in the present naticle, to direct attention to this matter, to indicate some of the conditions under which the field can be entered successfully, and he a short account of one of the local firms which is successfully producing what is wanted, to show some of the requirements which must be met.

The immovement of the agricultural implements in use here has been beset by several difficulties. The first of these is, no doubt, the fact that the foreign makers have rarely, if ever, studied the local requirements, and the variations in the local requirements, to suit small changes in conditions. Possibly they have never been in a position to do so, but the fact remains that the country-side is full of imported implements and machinery which has never been successfully worked. or if it has been employed for a short time, has been put out of court by some break-down which could not be remedied on the spot. The second difficulty which has rarely been met has been the relatively expensive character of modern implements. If you ask a man to replace a plough, for instance, costing five rupees, which he can make and repair in his own village, by one costing fifty rupees, you must show that the more expensive implement is exactly adapted to his needs, is immeasureably more efficient, can be repaired with at least equal case, and even then you will find, and rightly so, that a small cultivator, to whom afty rapecs is a fortune, will hesitate long before investing in the new implement. The third difficulty is that of repair. It is hard to conceive the isolation of nn Indian village. If the village blacksmith cannot repair un implement, it probably lies useless. Any one capable of dealing with the trouble is probably fifty or a hundred miles off, and the result is that the implement is laid aside, and simply rust away.

And yet, in spite of this, I wint to combut the elex that our cultivators of We-tern India are so hopelessly conservative that there is no chance of progress, and molern methods have no chance. Very much otherwise. With all the he-itation, and the right he-itation, that is felt towards new introductions, there is a very strong desire for more efficient and effective implements among the more advanced cultivators in almost every part of the Boarbay Presidency, and when an introduction is mide which meets the conditions, then it is taken np, and often with remarkable rapidity.

Among new implements, which when provided and proved, will be in extensive demand are the following :---

- 1. An iron turnover plough.—This need has been very largely net, after much experiment, by two or three types of plough made both in Europe and America, and now, as I shall show later, locally also. The Europeun plough which has best met the cultavitors' need in the medium and heavy black soil tracts of the Decenn is the C. T. 2 plough of Messrs. Runomes Sims J. Jefferies of Ip-with costing forty rupees in Bombay, and this may very well be considered as a basis for further development to suit more closely the local condition. This plough and its adoptations, such as that made by Kurlockan Bres, meationed below, has already been sold by thousands, and can now be seen in no in almost every district of the Decean.
- 2. A seed-drill within the means of and suitable to the needs of the cultivator.—None that I have seen have yet met the need of the conditions, and yet the need is very great indeed. The drill in nee at present, while very cheap and very ingenious, is extremely inefficient and leaves, even in the best of cases, about twenty per cent of the land missivin.
- 3. A clod crusher.—This is ladly needed in the very heavy black soil tracts of Western India. There is a Norwegian instrument which does the work very well, but it is too expensive, and the local implements are not powerful enough to deal with the extremely hard material found in the areas methood.
- Implements for inter-cultivation of crops.—Some of the country articles are quite good, but the demand which, implements of the

"planet-junior" type for cultivation, have received are sufficient to indicate that there is pleuty of room for business if the proper articles are supplied.

- Implements for preparing folder.—A chaff-entier for use here must be extremely simple and extremely cheap,—and these have in the last five years been locally produced in large numbers.
- o. Implements for water rusing, more particularly in connection with wells on which who's are usel.—No system of water rusing, satisfalls to these wells, from twenty to fifty feet deep, has get been devised which is more economical than the whot. It remains, therefore to improve this, to replace the leither of which the big is made by some more durable material, to obtain pullers which work with less friction for. This has partially been done by the introduction, after many failures, of a satisfactory iron whot which is slowly winning its way, and a well made iron puller, and other improvements.

These are, I believe, the most important implements for which a demand exists or is likely to arise as soon as the proper implement is provided. Some of them are already imported, but those imported always are apt to suffer from the already quoted difficulty of repair, and from the fact that they are foreign. This fact presents the designer from bewing the criticisms of the users in her our Indian conditions. Tals will be only got over when we have local firms who actually enter as munificatories into the implement trule, and make efforts to keep in truch with the users and be self by their criticisms. That there is an opening for such firm is indicated by the history of the firm of Messes. Kirdoskir Bool, or Kunlat Bood (Satara) on the Southern Markha Wallway. This firm, though still developing with considerable rapidity.

Its four let, Mr. L. K. Kirloikur, was an o'd intor and teacher in the Victoria Technical Institute, Bombry. After leaving there he went in for manufacturing and repairing hierales, first in Bombry and afterwards in Belgrum. In 1905 it was engreted to him that there was a goal business tidd in making chaff-cutters of a simple type, and on this have the precent farm havingon. The kind of chaff-enter made, received a very considerable welcome from the cultivators in the Southern

Maratha Country, and in the following year turnover ploughs, adapted from that made by Rausome Suns & Jefferies (previously referred to) were manufactured, and from that time development has been continuous, as the following figures will show:—

		Number manufactured and sold.					
	Hands employed.	Chaff-entters	Ploughs.	Roller-bearing pulleys for water- lifts-			
1903	7	_	_	_			
1900	no record.	225	2	-			
1907	18	515	45	_			
1008	40	641	183	53			
1909	60	274	237	-			
1910	70	201	527	38			
1911	85	234	906	263			

In June 1910 the 1rm had to more from Belgaum, as the laud on which their factory stool was required for the extension of the cantonement. A site was offered to them in the heart of the Krishna valley—the most richly enlitvated tract in the Deccan by the chief of Anndli (through his Karibhari, Khan Bhhadur J. B. Israel),—near Kundal Road Station (S. M. R.), and there a model village is being develope I round the factory. The place is run on modem factory lines, the benefit of the workers as very largely considered, free medical help and free quarters being provided for them and their families,—and a regular savings binks system run for them by the firm. Their coperation is secured by the con-tant offer of prizes for valuable suggestions, and a number of improvements have been introduced in this way not the multi-emplements made by the firm.

The implements already made are only a beginning. Corn shellers are made in fair numbers and other small implements also. The latest development is in making cart wheels, with turned cust-iron hule and turned steel axles. For these there is a very good demand, at any rate in the Krishna Valley.

I have described the firm of Kirloskin Brothers because they have proved the demand which exists, and the opportunities which there are for the development of the trade in agracultural implements in Western India. I believe they are only process; many others will follow in their steps. The dra when an powed implements were scotled at, is past and if the proper article is devised and produced, at as cheap a rate as possible, and with due regard to the local conditions in which they have to be worked, there is a market of considerable size practically at our does.

# Ganja Cultivation in the Ahmednagar District

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# R. D. Khandekar.

FURING a recent trap in connection with the college agricultural to on we went to see the well know graden owned and immaged by Mr. Conseipe. In this graden, many graden crops and first trees were grown, the chief of them being, gonje (hamp), sugarance, mangress, List and sucher courge. The largest purt of the area (about sixteen arms) was cornected by grajes, and I propose in the present stitle to

The name 'quy's' is given to the influencence of the f-male plants. Special care is taken to keep the ovaries unfertilized as the

de-cribe the Little information I have not about it.

fertilization of the ovaries leads to the formation of seed and renders the infloresence unfit for the manufacture of ganja.

The conditions under which the cultivation is carried on at Ahmeduagur are as follows:-

Rainfull:—The rainfull does not exceed twenty inches per year and this, I was fold, is quite sufficient for the growing of ganja. In case the rainfull is deficient, one or two waterings at the most are given. One watering is however considered essential at the time of increasing as it promoters stockness in the leave, which much increases the value.

Soil:—Deep black or medium black soil which is retentive of moisture is considered the best for growing this crop. In Mr. Curselpe's gardens, however, the soil was of a reddish colour and of alluvial nature, and the crop of graps had nevertheless grown vigorously.

Rotation: --Any crop except wheat is a good rotation for gangs.

Gram grown as a previous crop, 14 however, reported to give the hest results.

Manure: —Teu to twelve cart leads of farm-yard manure per acre are quite sufficient. The quantity of manure required chiefly depends upon the nature of the soil. In deep black soils no manure is necessary but in held soils it is individual-able.

Preparation of land: —The land is ploughed two or three times just after the previous crop is taken and is then harrowed until a good tilth is secured. The seed is sown between July and August, just at commencement of the season by a seed-drill, the distance between two adjacent rows being about three feet. The seed-rate required per higher of twenty-three gunthus is equal to two and a half pounds. The cost of the above amount of seed is from two to three rupes.

When the seed is germinated and the plants are about nine inches high, they are thinned to a distance of about six inches. About twenty days from the the time of germination, selection for the mule plants begins. These plants must be found out and approach before they have

o Equal to about 4} pounds per acre.

Howered as they will otherwise lead to the fertilization of female plant which, as mentioned above is not at all desirable. This operation is one of the most important factors in Ganja entirvation and therefore requires the most careful, punctual and skillful attention of the cultivator. The first inspection is called ' $\pi x = \pi x = \pi x$ " (Bal parakhani) or the inspection in the young stage. This searching for male plant is loue every week or even more frequently and has to be continued till the bary esting time.

It is not an easy matter to distinguish the male from the female plant, especially, in their young stage. It requires a practised and experienced eye. It was explained to us that the peculiar shape and whorling of leaves and the absence of a tapering-point on the 'Tik' '??a' on the male flower were the distinguishing factors. The name of '??a' This is given to the unopened flower bad, the one on the female plant hiving always a long tapering point.

Interculturing: -Interculturing is generally done between the plant by means of a bullock hoe,

Hartesting: —When the crop is ready for harvesting in about five or six mouths the signs of maturity become visible. The inflore-cence turns yellowish and the upper inflore-cence becomes lerge and round.

The harvesting is done at this stage and consists in cutting off the top inforescence and scraping off hy both hands by women of the axillary inforescences and young leaves. These are then immediately taken to the thrashing yard and spread there evenly. Next day, early in the moroung, the whole is trampled by men under their feet for an hoar or two, and is then turned over and over. It is trampled again in the cool eir of the evening.

This operation is done about three or four times in the morning and in the ovening the process being repeated for serveral days, the number of times being determined by the weather.

If the days are hot this trampling is danc more quickly and in a shorter time than atherwise as the object of trampling is to prevent the Ganja becoming dry and powdery.

-When it is sufficiently trampled over, it becomes sticky and then is tied into bundles either as it is or after being rorted.

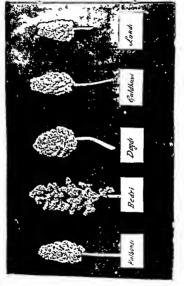
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This sorting is done generally by contract, 12 annus being given for cells builde of about half a pulla. The norting consists in separating the large and correselves and stricks from the inflorescences and small tender leaves. In this process nearly half the total produce is reduced. When the ganix is properly packed it is sent to the ware-house, and thence it is sold to contractors. Government collects duty on every palla of gang.

Produce:—The average produce per bigha is about one palla of 240 bist of well corted leaves and inflorescences. The price of the unsorted Ganja which the cultivator gets is from thirty to vixty rupees per palla and it soll at retul prices it is one to two rupees per secr.



A palla is 240 lbs. †About 400 lbs. per acre.



Varieties of Jowar in Ahmednagar District.

# Some of the Commonly Grown Rabi Jowars.

RY

### V. K. Kogekar, L. Ag.

JHHE varieties of Rubi Jowir most commonly grown in Ahmodnight District are-(1) Kalbondi (2) Bedri or Lalbondi (3) Dagadi (4) Guldhace and (5) Lalde.

Each of the above varieties has certain merits peculiar to itself which largely affect its distribution so that it will be of interest to note these special characteristics.

- (1) Kalbonds .- This variety, as its name indicates, has black glumes surrounding the gruins. The head is quite compact and conical in shape. The grain is quite white and has the appearance of pearls. The bread made from the grain of this variety is superior to that from the other varieties. The folder, too, is very valuable for cattle as it is very palatable and nutritions. It is said that the grain of this rariety is more attacked by weevils which makes it difficult or impossible to store. Owing to this defect it does not fetch as high a price in the market as on account of its other good qualities, would be expected. It ripens in 1 months, and is a good yielder. The fodder his always a good market as it is eaten by the cattle without wastage.
- (2) Brdr: Also called Lettende, on account of the grain being surrounded with red glumes. This variety is prominently marked out from all the others by its loose car heads. The cultivation of this variety has come into prominence (as it is said) during the last 12 years. It is an early variety and can be grown with limited rainfall. It yields rather poorly when compared to such other varieties as Kalbondi and Dagadi. It matures in 31 months. The ear being a loose panicle birds do not get a firm foot-hold on it so it is thereby protected from their attacks to a certain extent. The fodder of this variety is very coarse and cattle do not like it. It becomes still coarser if this variety is grown nader irrigation, and is then nuly used for feeding she-buffaloes. The grain can be stored for a long time if proper care is taken iu storage.
  - (3) Dagadi :- As its name indicates, the car-head is very compact and band like a stone. It is conical in shape and large. The 32

grains are set closely pricked together in it. With this kind of head there is another advantage and that is that birds find it difficult to get the grain out of it, though they get a firm foct-hold over it. The grain is duty white in appearance and smaller in size than that of Kalbonds. The Lernals are surrounded with white glumes. The variety is heavy yielder and is very generally grown for this reason. The grain is of tair quality and keeps well. The tolder when compared to that of Kallor de is a little infanor. However there a little wasture in leading. This is therefore a good variety for general cultivation as it can be grown without any special conditions of ram-fall. Dagade rivers in 1 months.

(4) Guldhare :- In appearance this re-embles Dagade except that the head is not quite so hard and compact as the latter. It yields well ouly to years of good rain-fall. The Karbee is poorer in quality than that of Digade. The grain is similar to that of Dugade. But it is a little bigger in size. This variety is cometimes found mixed with Dagade.

(5) Lald: -The heal of this variety is hard and compact like that of Dagade, conical in shape with the top portion of the cone cut off. The ear-stalk is bout downwards like a hook. The head is smaller than that of Dagada. It is a light sind crop and is general grown on shallow light soil portions near a hill-tile. The Karbee is very tough and without many side leaves and is not eaten well by the cattle who waste quite a portion of it. As a yielder it is inferior to the others and require- 4 months for matneits.

## Groundnut for the dry Tract of the Deccan. especially Ahmednagar.

#### V. K. Konekar, L. Ag. -04-6-6-20-

FIRE in ligenous variety of groundant is never grown in the District of Almehorgar except as an arrigated crop, and in taking up the recently introducet varieties from Japan and America the cultivators have followed similar methods to the a with which they were previously required d. This is to a call attention to the possibilities of the cultivation of grounding as a min crop without my importion in this district. If this method is presible then the area that can be deveted to ground ut can be considerably extended.

# The Art of Study.

P.Y

W. Burns, B. Fc., Professor of Botany.

MIII term student means, obviously, one who studies. Though all those who are taking courses at a college are assually designated students, there are, I fear a considerable number of them who hardly deserve the name in almost every educational institution. It is no napleasant fact that many stalents, for instance, concentrate their reading into the six weeks before the examination. Again, I think there are few who really know to take notes of a lecture, and still fewer who know to ntitles the library. I trust that the following hints may proce useful to such means.

For the purposes of our argument we may divide the means of staly into lectures, practical work, and reading. Practical work includes laboratory and field work, and reading includes the period of one's own notes and the use of the libraries.

As long as lectures remain n part of our course the student must be an expert in note taking. Now the essence of note taking is the expression in precise and abhreviated form of what the lecture has explained at con-iderable length. No attempt should be made to take down the lecturer's words in full, nor is it necessary or de-irable to construct complete and grammatical sentences. I quote in passage from notes actually taken by a Scottish student from a lecture on the Phaneroganis:

"Seedcase o embryo: fool mat stored as albamen or abs in embryo. Inis latter more adv. Poss o sep fm food materials. Fot Energy fr early stages oder when environ smitable. This placing o seed in good place often work o seed or other parts o Specularts. Seedaim of plant." This parage if expressed in full and without abbreviations would read thus:

"The seed is a case containing an embryo. Food material is stored in the seed either as allammen or absorbed in the body of the embryo. The latter arrangement is the more advantageous, since there is then no

possibility of the accidental separation of the embryo from its food. This food nutterial is a store house of potential energy which the embryo draws upon in its early stages of development when the environment is such as to stimulate germination. The placing of the seed in a good position is often curried out by special mechanisms of the seed or other parts of the Sporophyte. The annual the flowering plant is to produce seed."

Note taking almost necessarily means the use of contractions and abbreviations which each student must invent for bimself. The point, however, is to listen to the lecturer with concentrate i attention and then jot down in a few words the gist of his remarks. Drawings from the lecturer's black—board sketches should be done roughly, aiming only at accuracy in the main points. When the lecturer is drawing a figure on the black—board the student should try to draw it just as fast as the lecturer; the should not want for the completed black—board sketch before starting his.

It is absolutely essential that all lectures should be carefully read over at home on the same day as they were taken down. If this is done the notes can be added to and amplified, drawing on the mental impressions of the lecturer's words and sketches. If the perusal of the lectures is nostnoned, they are strange and difficult to understand when a student comes back to them. After reading a lecture through it is well in for down the man points and frame written questions for one's self on these points. Take the passage cited above. Questions would be-(1) What is a seed? (2) How is food material stored in a seed? and so on. If this anestion-book is preserved it is a most areful means of readily brushing un one's knowledge of a subject. The information obtained in a lecture must now be amplified by reading. First take the prescribed text. books, if any, then books from the library, and look up the subject both in chanter headings and in the index and consult every reference to it. It is an excellent plan to put abstracts and precis of these passages in the lecture note-book, alongside the lecturer's treatment of the same theme. The name of the book and its author, and the number of the page ought always to be attached to each abstract. Many books in the library are much too advanced for general reading, but they often give valuable facts on special points. No one should be deterred by the size or abstruseness of a book from iconsulting an any subject that concerns

him. After all this, it will still often be the case that some things are not clear to the mind of the stalent. He should then put his difficultres into the form of short written questions which he can present to his professors for solution.

The results of practical work in the laboratory and field are recordel mote-books. The value of a laboratory note-book counts in its being an accurate record in word and diagram of things actually seen by the student, and it should always be undemp in the laboratory and never touched at bonne. The laboratory and field note-books must be studied in connection with the subjects treated of in lectures and any discrepancies noted and their solution sought out.

Thus a body of knowledge in several subjects is obtained. Now knowledge of one subject must be connected up with knowledge of one other subject, and the connections between the various parts of one subject should be made fust in the mind. Thus take again the subject of the Seed. What ought that word to call up in the brain of a student of this college? First, the abstract idea of a seed—what it is and how it does its work; next various of seeds he has seen and examined their forms and adaptations; then the conditions suitable for the development of seeds or prepadical to them; thence he institutely goes into the biochemical side of the subject and considers questions of food, vitality, stimulus and so on. One might continue such an example indefinitely, taking in every fact in the Universe.

It is also well to put une's facts in order. To have facts in well defined groups in the mind conduces to clear thinking and accurate reasoning. The great advantage of such an arrangement is that one can put small groups into more comprehensive groups, and so on, until finally one can often get some simple expression-some formula-which will at once bring to mind a whole huge collection of facts which it would have been difficult to remember or in the stand synarticle.

Finally, it must never be forgotten that the best methods will be of no use if slackly applied. Until wark is still the only road to success.

# 'The Problems of an Irrigation Farmer.

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# G. L. Kottur, B. Ag.

Fig. 1.TER is one of the most fund imental substances to the life of while the performs in their life history are many. Apart from serving as fool it takes an active part in producing targescence, in causing transpiration, circulation of the sap, and transport of fool, all of which are vitally important in every stage of plant growth. For these reasons the encoessful growing of crops largely depends on the supply of water within the reach of plants which is either maintained by minfall or seemed by irrigation. The advantages of irrigation are little known in countries where the rain-fall is heavy and well distributed, but in places where the fall of rain is both secanty and unevenly distributed the highest success in agriculture in a large measure rests on irrigation.

Water thus is indespensable to the life of plants and is used more than any other substance. But it must be been a mind that it is not a plant food in itself. It does but little good in the absence of other plant foods in the soil, and sometimes it does more harm than good by its presence in excess, as it then cures waterlogging or brings to the surface a large quantity of injurious salts. Thus the problems of an irrigation farmer are not so simple as they appear to be at first sight. The use of irrigation water is often attended with many evils which can only be prevented by skillind management. The management of an irrigation farm therefore is not an easy task. It consists in securing an adequate supply of good water, in devising the proper methods of conducting the water in the fields, in regulating the supply according to the requirements of the crops, and lastly in laying out certain protective measures wherever necessary. All these things are put of the very day work of an irrigation furmer.

Water for Irrigation:—The irrigation water is generally taken either from wells or from restriots. His water of running streams and rivers is also used in irrigation but often it is collected into shallow tanks before it is applied for irrigation. In practically all cases, the

irrigation water contains some quantity of the salts of sedium, possessium, magnesium, and existin dissolve 1 in it. The amount of these salts is often very small but there are many cases in which water proposed for irrigation may actually be objectionable for purposes of irrigation on account of its containing a large amount of these salts. Such water is inquirous to regettion, but even if this degree of concentration is not reached, there will always be the danger that its continued application will make the land, after sometime, until for growing any corp whatever. It is therefore a vis-ble to test the irrigation water as often as required models not to run the risk of killing the crop or spoiling the land. Certain salts are, in small quantity, beneficial in so far as they supply plant food but their presence in excess is exceedingly injurious.

The irrigation waters derived from certain sources contain a lot of fine particles in surpension. These particles settle every time the land is watered and thus leave a fine layer of silt which accumulates in comes of them and forms a very valuable addition.

Altitods of Ierigation — The economical use of water, which is the most important matter in irrigation farming depends largely on the manner in which the water is conducted in the fields. Sprinkling of the land with water, which is most mestificatory both in point of economy and effect is practised only on a small scale in the watering of pleasure gardens. Irrigation by means of furows is very common in all places where the water is drawn from wells. Economy of water is one of the chief benefits that is derived from this method of irrigation. It is therefore always desirable to adopt this system e-pecually in canal tracts where owing to the every availability of n large supply of water the cultivators are generally in the habit of applying far more water than is actually required for the proper deteropment of their crops.

But in the case of crops which require only a few applications of water during the whole period of their growth, shooling is commonly practiced in order to save the cost and trouble of making and reminizing the furrows. This also facilitates the operations of hocing which have to be done very often in the case of such crops. In many parts of the causal areas on the Decean water is handled hadly and unconomically,—the system of shooling being almost universally a lopted. To get the best results, using a system of shooling, it is always necessary to exercise great care in sheeding the fields. Water should be made to man

as slowly as possible in between the rows of crops along the depression made by the interculturing instruments. This method will be found more effective than that which is more usually adopted, and should be practiced in all cases where furrow arrigation cannot be employed on account of its being more expensive.

The making an I manutaning of water channels as one of the important operations of in irrigation firmer. In the majority of cases the main channel should be had at an angle to the slone and the secondary channels should be made to run more or less along the slope in order to let the water into the beds without much inputy to the ridges. A maximum amount of wetting is secured by running the secondary channels exactly along the contour line of the slope. Much difficulty is often experienced on account of the change of levels in conducting water to various uluces in the field. The trouble in this direction can be minimised by I wang out the main water channel along a ruso I strip and by keeping it as wele as possible. The sides of the water channel should be well rammed to prevent falling in and a series of partial banks should be constructed by plucing stones at the bottom of the course wherever the land slopes considerably to provent scouring and to raise the channel by collecting the silt. This kind of water channel is simple to construct and when properly laid out should serve most of parneses.

The water channels have a tendency to become soon over grown with weeds. This often gives much trouble by blocking the current of the channels. The roots of weeds growing along the universurface of the bunds spreal out and perforate the walls thus allowing profuse percolation to take place. The semb growth on this account should be kept continually deduced and nador control. Digging or plongling in any of the water channels should be as far as possible avoided as it betters the prospect of coming weeds by loosening the soil. Ramming the sides so as to exclude the air if done occasionally will often prevent the water channels running foul.

Choice of Crops:—Apart from climatic conditions of the place, the selection of the most profitable crops depends upon the supply of water, source of manner, local demand for the produce, and the existing facilities for transport. The problem of labour also plays an important part in certain irrigation areas where the climate is unfwontable owing to the prevalence of malaria.

Sogue care is the king of cops in all the infigrition tracts in this part of ladia for more reasons than one. It is one of the most paying cope in the country. There is, everywhere, a constant demand for its prolone which again keeps well fee I ag time and our be courenfeatly transported from one place to another. Other garden crops such as pota'n, giogra, fremeric, suran, grandent, cillies &c. are generally taken in rating with most. This a statem of two overs nation with ragur cane as one of the crops is not announced in all the localities where facilities for anigot po exist. This procedure entails a large Les by quickly exhauting the manuful resources e-pecially minogen in the still and by havening the rise of anderground waters and the conseparat development of salt on the rufer of the land. The importance of organic matter in the soil of day regions is not negally appreciated, but it a with when infiguing is applied, and the lawish application of water to but containing a deficiency of organic metter is the direct cause of many imigation troubles. For both these reasons it is not describe to erry the had mader heaty impation year after year Unter the person a withing perral my in the G. bak moul tract, for incomes, a few year rotation like the following will seem to be very swinslike.

lst year.
Sogur ease.
2nd year.
Make and gram.
(Horaf) (role)
Orl year.
Callies or grandatio.
4th year.
Son for treen manure.

There are in this for come a fatirative beguninous crops which serve to in the six goes in the soil. Main thirties imminusly on the restical mature given to come and grain after make given concluding resolls. Sends well known to be an excellent preparation for the samewhap crops of output case. Chillies are one of the favorable crops in the named area of Golada. This crop yields well when grown after grain while diversity of work adver. In the fourth peer the land beneated by withhelding indigation and by returning the area crops to the soil. Groundout if grown in place of children will tend to bring the land into an even below which. In the irrigation districts in the Southern Maratha Country, and particularly in the Gokak canal area, the so-called karl land is very common. This land possibly owing to its heavy nature, refuses to grow any of the above mentioned craps. Khapli wheat and Brouth cotton seem to thrive on such soils better than other crops, and the relation, therefore, for these soils would be.

1st year. Brown cotton.

2nd year.
San (green manne ) and thaple wheat.
(tharf) (rabe)

Rational use of water:—The tendency of the farmers to be extravaguat with irrigation water is marked wherever there is canal irrigation. In view of the fret it is not uncommon to see the crops in irrigated tracts suffering from excess of water rather than for want of it. Under these circumstances the land becomes impoverished and the underground water and salts rise to the surface on as to seriously interfere with the growth of plants. The question of opening a canal therefore is a very serious one as it may actually tend to aggravate the position ultimately, oven in famines-tracker districts.

The amount of water which should be applied at a single irrigation and the frequency with which it should be repeated depend on the kind of crop, character of the soil and the rise at which the moisture in the soil is lost by evaporation through the crop and through the soil. All these things are so complicated and difficult to understand that it is not practicable to direct the irrigation farmer on the lines of these conrolling factors. Much, however, can be done in this respect by studying the requirements of a particular crop or crops in a certain locality and establishing truths for the acceptance of the ordinary cultivators residing in that trust.

It has been observed in the case of many cultivated crops that the drooping of the leaves takes place when the water content in the roal runs low and as not able to support the evaporation above. This condition is recognised by the most practical cultivators as indicating the best time for irrigating the crop. The growers of children of Golak

keep the soil in good condition so as to absorb the water given in surfer sequent irrigation which otherwise would tend to run off and be of little avail to the crop.

Irrigation and beavy seeding generally go band in hand in every part of the country. This practice seems to arise from the desire of the frimers to take as much as they can out of thic I hands. Proper spreing between the rows as well as between the plants if kept on well manurel fields not only increases the yield but also improves the quality of the produce to a remarkable extent. It also facilitates interculturing which apart from controlling the evaporation of soil moisture checks the weeds that cause much trouble by rapidly increasing in number and vigour in irrigation fields.

Irrigation farming on the whole is not easy and introduces many questions which are not considered by a dry land farmer. If used without care and thought, it will need does lead not only to the waste water, but also to serious and permanent damage to the lead. It rewards one who uses it with care but a reckless farmer who takes undue advantage of it nover exapes from the ultimate damage and serious loss.

### Reclamation of Lands under Tide Water.

E

#### Sunderrao Dinanath Navalkar.

ANDS under high tide water, that is to say, low lands, along the is seacousts on the sides of large creeks which become dry at low care capable of being reclaimed, either for agricultural puroposes or for preparing sait. Such lards are found on this side of the Bombay Presidency in the Salsette and Bassein Talakus of the Thana District and in Pen and other sea-coast Talakus of the Kelaba, Ratnagiri and Kanara Districts.

The first thing to be considered is, to see whether such lands are capable of being reclaimed at a comparative small expenditure so as to make the reclamation pay financially. The next thing to be considered is, to see whether the land after being reclaimed, can be brought under cultivation. Having considered these points, regular work or reclaiming land may be begun. But before commencing the work, the land should be surveyed and the line of the proposal due to stop water being spread over the land to be reclaimed, should be marked out on the plan, after taking levels on the land at different places at high tide, in order to enable the work to be done exactly, according to the requirements of the land.

The work of reclamation is carried on by putting a mind dam the height and width of which are to be determined by taking levels of water, at high title, and the situation of the dam to be determined from the currents of high tide water. If the currents are strong, the dam required to be put will have to be of greater width in order that it may not he washed away or damaged at every high tide. Under normal conditions, a dam eighteen feet wide at the base and six feet wide at the top with a height of six feet will serve the purpose if there is no danger of it being washed away. It is better to have more slope on the outer side of the dam, than that on the inside, as there is greater possibility of the earth on the outer side of the dam being washed away.

The situation of the dam after taking levels on the land at different places at high tide, as stated above, should be fixed in such a way that the greater portion of land to be reclaimed would not be under seawater at an ordinary high tide. The length of the proposed dam will depend more or less upon the situation and the position of the land to be reclaimed. Care should be taken to mark out the line of the dam and to avoid creeks either small or large, that may come neross the suggested line of the dam, by giving a turn if possible to avoid them. If this cannot be done there is no other alternative but to fill them up along the line of dam with earth. While commencing the work of contraction of a dam. it is better to mark out the base of a dam to be constructed by coir rope lines in order that the dam will appear regular and next. Earth for dam construction is taken up from the outer side of the dam at a distance of twenty-five to thirty feet away from the base of the dam by digging pits ten feet square or ten feet by twenty feet and one foot deep-The wet earth is dug, not with pickaxes and shorels but he a wonden

board of dagger-like shape called 'Penss'. The clod of carth that is dug out with it, is thrown between the marked line of the dam to be constructed and two to three men are engaged to trad upon the clods of wet earth, in order to consolt late the whole mass of carth. In this way clods of earth are put together till the dam is constructed to the required size and heights.

If a large creek, any about eighty fact in width which becomes dry at low tide, is required to be closed by a dum, the best way is to fill it up to the level of the ground before high tide begins. The work of laying a dam across such creeks is generally begun between the sixth and twelfth day of the first or second half of the Hadu months, when water at high tide does not generally rise up as high as it rises on the new moon and the full moon day.

In order to put a dam across large and shallow creeks the best way is to put first on either side of the base line of the proposed dam, dykes of dry stone about four feet in with at the base and two feet at the top with a gentle slope on the outward side to brift the height of depth of the creek, in order that the closs of earth for filling up the creek may not be washed away being thus held together by stone dykes. The next thing to be done, is to construct a Bamboo and Triour shrub (Barringtonia neutangula) feeding on the line of the proposed dam, in such a way, as to leave a passage of about four feet in width for water to pass in and out in case the work of filling up the creek is not completed before the high tide begins.

After making these preliminary arrangments, the work of filling up the creek is begun from both the sites of the creek by bount three bindred men, (the number of men to be engaged depending upon the quantity of work to be done), one hundred and fifty men on each side, by throwing into the creek closs of earth that are dag from pits at a distance of 50 feet away from the creek, with the wooden board called 'Pensa'. Care should be taken to see that earth is not taken from the place nearer the creek to be filled up and the pits that are dug up are not more than two feet deep.

Sometimes guany logs are filled up with earth and are arranged on either side of the marked line of the dam, one over the other, in piles like a wall in order that the clots of earth thrown into the creek for filling it up may not be washed away and dissolved in case the portion of work remains uncompleted before the high tide begins. The gunny bags will to a great extent hold the earth and will not allow the earth to be washed away and thus save the expense of possibly having to fill no the creek with earth agun.

If a creek is wide, and at the same time deep, that is, it does not become dry at low tide and that water remaies in it to the depth of six to ten feet, then in that case, in addition to the dry stone dykes on both the siles of the proposed dum, as already stated above, disabled native crafts, filled up with stones and earth should be put lengthwise in the creek along the line of the dam. In this way a deep creek is bottled up and at the same time the depth of the creek is reduced to a greater extent, and thus there is less possibility of clods of earth that are thrown into the creek, being dissolved into the water of the creek. In this way a dam across a deep creek is constructed.

The next point is to consider about the location of slances, to allow storm and other water to pass out of the reclaimed land. The number of shires and their position will depend on the dramage of the land during the rains. Care should be taken to see that the size of shires is sufficient to carry floodwater unickly out of the reclaimed land otherwise the reclaimed land will become water logged and besides, there is a great danger of having breaches made in the dam on account of the force of the floodwater on the dam from within. In this way there will be great loss to the standing grap and, bendes, great expense will have to be incurred to close and fill my a breach in the dam again.

Sluices should be located at one of the places in the dam, through which the natural draiouge of the land would ress. At the same time shives should not be located near a big filled up creek. Having fixed up the location and number of sinces, the next point for consideration is, to see what kind of sluices would serve the best purpose at a very small cost. According to my experience the shaces that we have constructed at our " Diganath Khar" are of the best and cheapest of the kind in the long run. They are constructed of ordinary flap doors four feet by three feet six inches in size suspended on from hers passing through female hinges fixed to the doors; which automatically open out-ward during flools, thus allowing floodwater to pass out, and shut at high tides, preventing ser-water from entering, and spreading over the reclaimed lind. Such doors swe the wages of a man to watch the slaices during the rains to see that the passage for the floodwater to go out is not closed, as in the case of screw shrices, 34

There is a great disadvantage in constructing screw slates, because in a watch-man absents himself at a time of flood or neglects to raise any the screw slates board, then there is the danger of lawing breaches in the dam. In the case of a flap-door slatice there is little danger of lawing breaches in a dam for the flap-doors do their work automatically of opening for floodwater to pass out and of sluttling against high tide water to enter in. Give should be taken to construct a slate with deep found tion filled up with concrete of the soil on which it is to be constructed is not a hard rocky soil, otherwise there is a great danger of the slutice work, being washed away during the rainy season by the force of the storm water. The only yearly expense for a flap-door slutice is that of applying coul-tar to the wooden flap-doors, and the cost of incomes about a tupes or two according to the number of doors. I have attached a plan of flap-door sluice, constructed at our "Dimanath Khar".

After completing the chief works of building the dam and constructing sluices, the next thing is, to construct from within ten to fifteen feet away from the dam, a minor dam, with a width of three feet at the base, one and a half feet at the top, with a height of two feet, parallel to the dam, which may well be called the main dam, in order to catch sea-water that may percelate inside through the main dam at high tides. The necessity of this dam is that it does not allow sea water that percelates through the main dam at that percelates through the main dam to spread over the reclaimed and and to become suline; and thus makes the land fit for cultivation.

The next thing to be done is to root out may sea-water shrubs called - Your' ( Harringtonia acutanyada), plot out fields in squares or rectangles, and lay field divans, according to the nature of crops that are required to he grown. Two or three years are required in Western India before any crop can grow on the newly reclaimed land, for the reason, that the soil was saturated with minute particles of salt formed from the sea-water that dried after the land was reclaimed. Unles these particles are washed away by rainwater for two or three year continuously the reclaimed land cannot be brought under cultivation.

If there are a number of creeks on the reclaimed land the best wa of seeing them filled up to the level of the ground, is to have cross dams in the creeks at an interval of one hundred feet. By this process which is known as 'Warping', the creeks will be naturally filled up in course of time by the silt of floodwater during the rains. In this way low lands also mised up to a certain extent. And so the reclaimed land can be brought more or less to one level. The principle at the bottom is that during rains these cross dams hold the muddy water and the other impurities of the surrounded land suspended in floodwater while flowing from one partitioned portion to another, and thus slit and slime are deposited in these portions until they are on the same level with the surrounding land. Thus during the course of few years, the low land will be raised up to the level of the surrounding land. The truth of this principle is clearly observed from the pits that are dug on the outer side of the dam for taking earth for constructing a dam. These get filled up during the course of few months, because the slime of seawater is deposited in them twice during the course of twenty-four hours at low tide. This occurs because the slime is rapidly congulated in seawater and is, hence, more quickly deposited than the slime in fresh water. By the method described, the water logged lands can be brought nuder cultivation. It takes, however a long time to make low lands in level with the sprrounding land.

The crop that is grown on newly reclaimed land is that of inferior kind of rice, known as ' Bhat' or ' Khare Bhat' the hask of which gives of a saltish taste and the rice of which is of reddish colour. For the growth a crop in reclaimed lands, the land need not be ploughed for year together, even when a better kind of coarse rice erop, generally known as 'Sweet Bhat', is grown on it. After a few years the land hecomes fit for the production of the better kind of sweet coarse rice. The rice seed is spread broadcast un the land, just before the commencement of the monsoon, or germinated seed is thrown on the ground just nfter two or three good showers of rain. The object of the first method of sowing seed is to be secured against scanty rain at the commencement of the monsoon. Very few cultivators adopt the first method of sowing in the coast lands of Western India, and the second is usually adopted by almost all cultivators. After the seed is sown there remains nothing to be done except in remove weeds from the field and see that water from the fields does not escape away through breaches in the field dams. Some use ploughs and harrows in newly reclaimed lands to remove weeds just after twant three showers when the soil becomes soft. This instead of saving labour tends, bowever, to injure the crop by stirring up the sub-soil, which is more saline than the top soil So repairing the dum instead of taking it from the outer side as is usually done. The earth from reclaimed had has more or less become 'sweetened' and when we put the same on the top of the dam, grass grows on it luxuriantly and so the top of the dam is protected from rain.

The texture of the reclaimed land is much improved after growing sult nee crops for some years and better crops can be grown on such lands Coconnut trees and mingo grafts thrive well if there is smiticient quantity of sweet water available close by. If no sweet water wells can be day close to the reclaimed lind there is no alternative but to depend upon the run water and no crops can be grown at any time of the year except during the rains. In this way the lind will remain idle for the greater part of the year. So if 'sweet' lands i. c. Khary lands adjoin a reclaimed area, one should go in for purchasing a few acres, for digging wells in order to plant coon unt trees or other gool crops. In this way reclaimation of lands for agricultural purposes will be more profitable.

It will be seen from the above facts that reclaimed lands which are known as Khars do not require the services of cattle for agricultural purposes to any great extent, nor do they neel agricultural implements except crow burs and the khadat if only rice crops are to be produced. The cultivators from the Pon Taluka in Kolaba District are experts in growing good rice crops from Khars, when compared with the other cultivators in different places. These men know very well how to bring Khars under cultivation, and besides they are extremely industrious. From my experience I have found out that they are the best sort of cultivators for growing rice crops on reclumed land, and the yield of their produce is always greater than that of other local cultivators.

Now I shall turn to the practical side of the question of our "Dinamath" Khars viz., the terms and conditions with the Government and our tenants and how far the reclamation has proved successful.

The land has been leased out to us on a lease of 999 years by the Government, after pyring about Rs. 10,000 as the price that was fixed according to the highest had in an anctoo, held by the Government on the spot in the year 1889.

The principal terms and conditions of the lease are that we are to he exempted from paying any revenue to the Government for the period of first ten years and that for the next twenty years the revenue is to be paid to the Government at the rate of four annus per acre plus the Local Fand ce-s. After the completion of twe sty pers 1.6. after thirty pers from the date of the parchase of the land it is to be resurveyed and reas-eased according to the terms and conditions prevailing them for land in the surrounding localities. After the expiration of the period of the lease it is to be renewed.

As regards the terms and conditions with the tenants they are the same as those prevailing almost everywhere on our side. They ented into a yearly agreement with us and bind themselves to keep the dam of their fields in repur, to sow seed, to look after weeting &c., to reap the crop, to to it into shaves, to stack them at a threshing place, to thresh the sheaves and collect the gran and do all other necessary thangs at their own expense and to give us buff the quantity of com and control and the land they culturate remains no more in their possession as soon as the crop is gathered, unless they renew their agreement for the next year.

The total co-t of reclamstion has come to about Rs. 27,178 which includes the sum of Rs. 8,365 as interest at 0% on the capital spent, till the end of September 1826. The reclamation work was completed after a long delay of five years from the time of its commencement on account of the sullen transfer of my father the late Mr. Dinanath Harischandra, first grade P. W. D. accountant, to the then newly created post of travelling auditor. Although the reclamation work was completed in the year 1894, some portion of the land became fit to be cultivated from the year 1894, and one moods and fifteen fares and eleven payates of Rate Bhot was received by in us the half share of the produce from about nine acress of land in that year. In the year 1895 the produce from about nine acress of land in that year. In the year 1895 the produce was doubled and the area of land cultivated was also doubled. In the year 1895 r. e. in the year of the completion of the reclamation work the land brought nucler cultivation was about thirty acres and the produce of that year of our half was only one moods and sixteen payats sowing to the great drought in that year.

Now we shall see how far the reclamation proved to be successful finescally after making the above preliminary remarks as to its produce when just completed. In the year 1897 we were able to recover net 2½% interest on the sum of Rs. 27,138 and the land brought under cultivation was about forty acres: and the average yield per acre was five farces.

In the year 1898 about eighty acres of land was enlitivated and the average yield per acre was ten fares. This year we were able to produce sweet coarse rice for the first time, and the net interest that we were able to realise was 3.55.

The average interest that we were able to realise on the capital during ten years i.e. from the time of the completion of the reclamation work to the year 1905 was at 356 and the land that was brought under cultivation was about one hundred and forty acres, and the average yield per acre was ten fares and during the last five years that is from the year 1900 to 1910 the average interest that we realised wis 345s, the land under cultivation is at present about two hundred acres and the average yield per acre of the land actually under cultivation is about eighteen fares.

It may be difficult to understand, bow, out of 600 acres of land, only 200 acres have been brought under cultivation. The reason is that some portion of the land is not fit for cultivation on account of its low level which will be raised in due course of time by the method of warping as already explained above. Beyond this it may be said that although most of the land is fit to be cultivated, on account of want of cultivators it has remained uncultivated and hence we re this only a small rate of interest. But as time passes the land is improving day by day and so the amount of interest that will be realised on the capital will tend to increase. In the ead the Khar will, we believe, be a profitchle concern if we are able to procure labour to cultivate the land, otherwise not.

During the monsoon of 1011 I did an experiment with regard to the growing of fine sweet rice on an acre of reclumed lund, in order to show to the enlitrators that reclumed I had which is generally termoù a 'Khar' can be made to produce a fine quithty of sweet rice with the same amount of labour as is required for producing course sweet rice, and I am glad to state that the experiment proved to be successful and it convinced the cultivators that fine sweet rice can be produced from 'Khars'.

## Seed Testing

EY

# G. D. mehta, L Ao. B. A (Camb.).

FACOST of the material given in this article has been published in Land of the Agricultural Department Bombry, but it seems worth while thit some of the results described there might be summarised and repeated here in the form of an article for the information of those who have not got enough time to refer to the various bulletins and go into the details of the subject.

Nature of seeds.—A seed consists of a young plant or embryo with a supply of food either in the embryo or surrounding it, all enclosed in the seed costs. The food is formed by the parent plant and is stored up in the seed to give the young plant a start in life. Some seeds have a small amount of stored food, while others have enough to beep the young plant growing several weeks without having to obtain much food from other sources. As the seeding develops it gradually makes more and more of its own food until flaully the stored food is no longer needed.

The necessity of testing seed arress from the fact that not every sample of seed consists of pure seeds as it professes to do, nor does avery pure seed continual living germ the absence of which makes the seed useless for the reproduction of its kind.

Gool seed is essential to successful agriculture, no matter how well the farmer prepares his land, no matter how much time, labout and money he spends on it, if much or all his seed fails to 'come up' he will either have a poor crop or will be obliged to resow, thus losing time and labour.

The expense of preparing the land is the same whether good or bad see it used, and the cultivation and management of the crop, whether large or small is nearly the same; it is therefore important that the seed obtainable should be sown as the difference in primary cost between this and seed which is doubtful is, small compared with the difference between the find results obtained from using them.

Bulletins of the Department of Agriculture, Bombay No 10. 37, 43 &c

"The best seed obtainable is never too good" is a maxim which should always be appermost in the mind, when sowing is under consideration. Cheap seed is not necessarily bud, but it practically always is so. The cheepst seed is usually the most expensive in the end. Bud seed leads to disappointment in many ways, besides the defection crop which often results from its use. It is frequently the indirect cause of trouble in introducing weeds, which smother the erop and leave the land in a foul condition; seeds of prinsitic plants, as for instance, Incerne dolder, and spores of fungus diseases, as for instance, jower sumt are also present, and these are accountable for many of the diseases of farm crops.

There is every reason to believe that one cause of the partial failure of crops is due to the use of inferior seeds. For instance, cotton seed ordinarily used in the Brouch and the Ahmedangar districts for sowing purposes contains on the merage less than sixty per cent of useful seed, that is to any seed which will grow into a plant when planted under favourable conditions.

Furmers and gardeners get seed from one of two sources, they either grow it themselves or buy it. If the former, there is less danger of its being poor. The chief source of poor seed is careless handling in harvesting, threshing and storing. Only well-to-do farmers are able to store their own seed. The poorer cultivators are obliged to use up all the grain that they raise from their farms either for home consumption or to pay the dues of Government and the Saukar. They are therefore mable to carry an adequate stock of seed from barvest until the following seed-time, and have to buy their seed from a relation or a neighboar at a very beavy rate. Failing this they have no other recurse but to approach the village denne, or their Saukar for their seed and accept whatever the bania has got to offer and pay over it interest of twenty-five per cent or more. It can easily be understood how this may lead to the sowing of poor seed and also to deterioration in the type of seed sown.

The value of any particular sample of seed, leaving aside for the moment the question of whether the seed be of the correct variety or no, depends on three factors. These are in the first place, the purity of the sample, or in other words its freedom from dirt, or the seeds of weeds in the second place the proportion of seeds which will germinate; and in the third, the speed or energy of germination. In some cases of course, a rough estimate of the quality of the seed may be obtained by an eramination of its shape, or our and smell; but this is not sufficient Seed may be made to appear what it is not in reality. A little oil mixed with a sample, will make all seed appear as new, and it is only after a determination of the above factors that a sound judgment of the quality of a sample of seed can be formed.

Purity:—The imposition generally pre-out in a sample of sect are of two kinds, namely :—

- (1) Heckanical, { c. g. kroken seed, stalks, particles of clay, sand, dut, foregange and deed matter { pieces of class &c.
- (2) Organic or Laving matter { c.g. need and seeds of other crops.

A small percentage of deleteriors cools often means a considerable number of weeks per acre, hence in examining the samples, it is not morely powersary to determine the total amount of impurity present, but its nature is of importance.

To determine the purity, a sample is weighed and separated into (1) pure seed, (2) word seeds, (3) inert matter, dirt, broken seeds &c. Each is then weighed and percentage of parity found out.

Germantin capacity:—The germiniton capacity of the pure scol or proposition of seeds which will germinate is next determined the embryo or joing plant insite the seed must be after for the germination to take place. The number of ungerminable seeds in any sample will depend upon (1) the kind of seed, (2) conditions of growth, (3) age of seeds, (3, muthals of grathering and storing do. Imperfect development of the embryo during supering, mechanical injury in threshing and ginning and too high a temperature and excess of moisture in the storroom are very only the causes of poor germination capacity.

A bome graduation test may be made as follows:—Lay a moist blotter or a given or next cottons finance on a plate. Count out one hundred seeds put as they come. Put them on the moist blotter, over with a piece of paper and then with another moist blotter. Lay over this a time of plane or over with an interted plate. Keep in a mode-

rately werm place and examine from time to time. Remove the sprouted seeds and count them to get the percentage of germination. Several samples may be tested at one time on a plate.

When the germantion capacity has been determined, the percentage of neaful or fiving seed in the original sample can be given. This is simply obtained by multiplying the percentage of germination in the pure seed. Thus a sample of seed showing 90 percent parity and 80 per cent germination has a real value of 72 percent only, that is every 100 lbs. contains only 72 lbs. really good and neaful seed.  $\frac{90\times 90}{190} = 72 \text{ percent}.$ 

Energy of germination:—In a blitton to pare seed possessing a high percentage of germination, the farmer requires seed that will spout aniformly and vigorously. Often a seed will have vigour enough to start germination but not enough to be able to establish itself in the soil. It is not enough that a seed germinates, but it should geniance vigorously also. Will upone I seeds usually germinate more rapidly than those imperfectly repeated. Immature seeds produce weak plants and when stored lose their germinates; power somet than well grown mess.

Drawing a sample of seed for testing:—The sum in relecting a simple of seed for testing should be to obtain in as small a link as possible at least some seeds of every kind and greefs in the whole quantity, and in the proportion in which they actually occur. Samples must never be taken by pix king out the seeds one by one since this almost invariably results in the selection of too high a percentinge of these seeds that are the largest and apparently the best. If the quantity to be tested is considerable, small amounts should be taken from different excess of the mass. In taking a samples forms a long, it must not be taken from the top alone, but also from the middle and from near the bottom. These small samples, from the larger samples out of which the proper amounts of seeds are to be taken, both for testing the parity and germination expectly, are thoroughly mixed.

The proper quantity for a sample of small seed to be tested, as for astance seeds of tolarca, would be about one to two\_ounces, and in he case of larger seeds e.g. jowns, when it is a quantity not less than our ounces should be taken.

Storage of seed and protection against secreti attack:—We must ways remember that seeds are alive. It is true that they are dormant and can stand some adverse conditions but they are not immune from anyury. One of the chief causes of the poor germination of cereal seed is heating during the storage. Any seed that smells musty needs to be tested hefore heigh according to graving surposes.

The greatest enemies of seed when stored by a farmer are weevils. Bajri and Jowari, if preserved in the ear and in sacks projectly filled and covered on all sides with a thick layer of '6 bins' or straw, will keep free for a long time. Some of the people have gone further than this; they mix woollishes and sometimes a lattle mercury with the Dajrigum and then store it in large earthen jur. It is observed at the seed testing laboratory, Poona, that the treatment of Bajri grain with mercany does not materially impare the germination capacity of the seed.

Tur, Wal and other pulses are protected against the weevel attack by smearing them with some oil mostly custor or Til oil.

In this connection, I might mention our attempt at this laboratory to combat the weevilettack in cereals and pulses by smearing them with heavy petroleum oil. The effect of petroleum oil, when need in quantities, as much as about two oncess and a brill per ten point softle seed americal, has been to scroonsly diminish the germination of both the wheat and jowar seeds, while its effect on the Tur seed has been very small.

On the whole it is clear that in the case of pulses, a smearing with about two ounces herry p-troleum oil per ten pounds of the seed smeared, acts as a complete presentive of weell intack, without any appreciable injury to the seed for it least twelve months, even when bodly attacked seed is quite close by. The and other pulse seeds of similar thind are those which are usually most seriously damaged by weevils. Smaller quintities of the petroleum oil than two ounces per ten pounds of the seed smeared, have not been quite so successful in preventing the weevil attack, after three or four months of storage in contact with the oil. Of coarse it will immediately be recognised that seed smeared with petroleum oil cannot be used for consumption as even after twelve munits it gives off a very objectionable smell.

We may now turn to a brief consideration of the quality of the actual samples of seed in use by the cultivators of the Bombay Presidency. For Gujerat and the Deccan special investigations were undertaken for one district in each of the provinces, while for the Southern Mahratta Country, the Konkan, the Khandesh, a large unmber of samples of different seeds have been received for examination from the Divisional Inspectors of Agriculture and Superintendents of various farms in those provinces. The results obtained have been recorded in the various bulletins issued by the Bombay Agricultural Department, on the examination of the seed supply of the Broach and the Ahmeduagur Districts. special investigation was also undertaken for an intensive study of the seed supply of a village near Poona. The average results given for the various crops of the Bombay Presidency in the following table, set out in comparison with the e of exhibition samples received from l'eth (Satara District ) are calculated from the tolal results of all the above mentioned samples of seeds examined.

The average percentage of ascful seed obtained for all the samples of occal seed examined (in all 1133 samples) is 84.5 per cent; while that obtained for the exhibition samples of the same is 92.4 per cent. There is therefore a difference of about cight percent in favour of the exhibition samples. The western standard of germination capacity for similar cered seeds is 95 percent. Thus our exhibition samples nearly reach it, but in the case of ordinary samples of cereal seeds used for sowing purposes, we have much to improve.

In the case of pulses, the average percentage of aseful seed for all the samples examined (716 samples in all) is found to be 84.4 per cent; while that for the exhibition samples of the same seeds is 80.1 per cent. The western standard for similar pulse seeds varies from 95 to 98 percent. Thus in this case also our samples are very much below the mark.

With some pulses the germination is greatly impaired owing to the presence of 'hard' seeds, with others owing to weevil attack. 'Hanloss' is generally due to the thick impervious seed coats of the seeds, through which water cannot permente and reach the embryo plant within the seed to make it grow. When a 'hard' seed is scratched on its surface with a pin, it sprouts in many cases on the very next day.

Tree	American al	Correct	Transfer .

			_	
Common Name.	2	Latin Name.		Source
Wheat		Tritican		Different parts of the Bombay Presidency
do Jowan	:	ರು . ಕಾರ್ಡಿಯ ಸಾಗ್ರೆಕಾಕ	-	Exhibition Sample Different parts of the Bombay Presidency
do Bajri do		do Pennisetura typhoid do		Exhibition samples  Different parts of the Bombay Presidency Exhibition samples
Bire do		Oryza sativa do Paspalam Serobieni		Inflerent parts of the Bombay Presidency Exhibition samples
Žą	474	tum Esteria itali Paricum M.		Different parts of the Bombay Presidency Exhibition samples
T <del>=</del>	_	Capanna indions	~	Different parts of the Bombsy Presidency Exhibition samples
Gram	-	Ciest Aristerum do	-	Different parts of the Bombay Pre-identy
Enitic do	:	Dollahos Liforns do		Different parts of the Bumbay Presidency Erhildtion samples
Math do Mag	:	do .		Different parts of the Bombay Presidency Exhibition samples Different parts of the Bombay Presidency
do Udid do	-	do Phasolus ratians do	-	Exhibition samples  Different parts of the Bombay Presidency Exhibition samples
Charli	-	Vigna Catiang	-	Different parts of the Bombay Presidenty Erlibition samples
Vzl do	-	D.fichos lab-lab do	-	Different parts of the Bombay Presidency Exhibition samples
Gaver Lang		Cramopals peuralio Salburus Falbras	ide:	Broach District
		Session indices	_	Different parts of the Bombay Presidency
Sofflowers do Linssed	5e₫ ~-	d5		Ahmedneger District Exhibition samples Different parts of the Bumbay Presidency
Nigerseed do	_	Gnizotis alysémies do Rienns Communis		do do do Exhibition samples Different parts of the Bombay Presidency
do Cotton ses	a	do Goesypium	_	Exhibition samples  Different parts of the Dombay President
Decem ho	mp	Hibiseus et ahiun	F	c5 c5 c5

Numbor of	Parity %	Germination	Useful sceds.	Remarks.
233	95 6	90 3	86.4	Some of the samples were attacked by weevils.
6 324		93 2 82 6	93 802	do do do
4	98.2 99.3 97.5	03 6 85 03 4 90 3		
	97 2 97 8	87 3 90 3	84 6 88 3	
11:	07	93.4 95.1 91.7 85.6 91.2 95.7 97.3 86.7 97.3 83.8 94.2 89.7 71.1	70 5 91 3 92 3 87 3 98 87 3 98 82 9 9 82 9 82 9 82 9 82 9 82 9 82	Some of the samples were attacked by weevils.  About 1056 'hard' Seeds.  Some of the samples showed about 5056 'hard' [seeds.  Some of the samples showed 20% 'hard' seeds.  do do do 1056 do do do 2056 do do do do 2556 do do do do 2556 do Some of the samples were attacked by weevils.
2 3 1 12	8 94 5 98- 0 96- 2 95- 4 98- 3 100	96.3 93.7 98.2 79.2	85 3 81 3 97 5 93 1 89 7 96 4 78 4 88 5 56 7 83 5	

In the case of oil seeds the average percentage of useful seed obtained for all the samples examined (namely 296 in all) is 85.5 per cent. That for the exhibition samples of the same is 94.1 per cent. Thus the ordanny samples of oil seeds used for sowing purposes are about nine percent interior to the exhibition samples.

The climix of low quality of the seed used for sowing the land is reached, when we come to the cotton seed. The average percentage of useful seel obtained for all the sruples of cotton seed examined (namely 120 m all) is 56.7 per cent only; that is to say nearly half the amount of the seed sawn is huried in the ground as dead organic matter. This can be made quite clear by means of the following flowers.

Fig. No. I represents 109 pounds of cotton seed as bought. No. II shows the quantity of pure, genume seed in the same. No. III gives the amount of husk, dirk de., in the original quantity. No. IV shows the quantity of damaged and dead seeds in the original seed. No. V undicates the quantity of pure and germunable seed in the whole amount, that is to say useful seed hercont.

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では、本語を八大大の、本本人では、	In the state of th	6 Han	THE STATE OF	207 10s.
No I	No II	No. III	No. IV	No. V
100 lbs. cotton seed	Pure, genuine seed in the	Impurity, husk, dirt	Damaged and	Pure and germinable
as bought	ваше	&c.	dead seeds.	seed.

Thus we see how low is the quality of the cotton seed, which is used for sowing purposes by our farmers. But even this is not all, The proportion of inferior seed is really even greater than would be indicated by these average figures; for included among them are a considerable number of samples of really high quantity. Hence it is obvious that very inferior samples must also be found in large numbers. This is very clearly shown by the following summary derived from a consideration of all the samples of cereals, pulses, oil-seeds and fibre crops examined.

Out of the 1133 samples of cereal seeds examined.

```
9 gave between 30 and 40 percent of useful seed. ( '8 per cent.)
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 33
                   form 0s.
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                   60 and
                            70
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100
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                                                                   ٠.
166
                   70 and
                            80
                                                        (14.7 ,,
                                 •••
                                            32
                                                  ,,
            77
412
                   SO and
                            90
                                                        ₹37.3
             12
                                                   ,,
399
                   90 and 100
                                                        (35-2 .,
             ٠.
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Thus over twenty-eight per cent of the samples of coreal seeds gave less than eighty per cent of useful seed while the average percent of useful seed is 84.5.

In the case of pulses, out of the 716 samples examined,

```
4 gave between 20 and 30 per cent of useful seed ( .0 per cent. )
 5
                  30 and
                           40
                                                        ( .7 ,,
                                                 25
                                                                  11
 14
                   40 and 50
      ••
                                                  ••
                                                                  ٠,
 20
                   50 and 60
                                 ,,
                                                        3.6
      ••
            11
                                                  ••
                   60 and 70
 46
                                                        8.4
      ••
            ,,
                                           ,,
                                                  >1
 02
                   70 and 80
                                                      (12.8
            11
                                           ,,
                                                  33
247
                   80 and 00
                                                      (34.5 ,,
      ,,
            ٠,
                                 **
                                           ••
                                                  "
282
                   90 and 100
                                                      (39.4 ,,
```

Over twenty-six per cent of the intal samples examined contained less than eighty per cent of useful seed. The average percentage of useful seed is \$4.4.

For the oil-seeds, out of the 296 samples examined.

```
1 gave between 20 and 30 per cent of useful seed (0.3 per cent.)
                  30 and 40
                                                       (°0·3 ,
                                "
                                          13
                                                 ,,
 10
                  40 and 50
                                                      (`3∙3
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            ,,
                                                 ••
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                   50 and
                           60
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                                 ,,
                                                       (2.4
            ..
                                           ,,
                                                 ,,
 13
                            70
                  60 and
      ٠.
            11
                                                      (4.4
                                                 "
 40
                   70 and 80
                                                      (13.5
      11
            ,,
                                 "
                                           .
                                                 ,,
106
                  80 and 90
                                                     € 36.0
      ,,
            ••
                                           ٠.
                                                 ,,
118
                  90 and 100
     ••
            ,,
                                                     (39.8 ..
```

Over twenty-four percent of the total samples of oil seed crops examined are below the eighty percent standard of useful seed; while the average percentage of useful seed ablained is \$5.5. In the case of cotton seed the figures obtained are most interesting.

Out of the 120 samples examined,

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4 gave between 20 and 30 percent of useful seed ( 3.3 per cent. )
                                                     (37.0 ..
45
                  30 and 40
           ٠,
18
                  40 and 50
                                                     (15.0 .,
    ٠,
           ٠,
                                                                  ٠.
19
                 50 and 60
                                                    (160 ...
    ,,
           ٠,
17
                  60 and 70
                                                    (14.0 ..
                                                ..
                                                                 ••
    ٠.
           ••
                                ٠.
                                          ••
15
                  70 and 80
                                                   ( 12.5 ...
    ,,
           ٠.
2
                  80 and 90
                                                    ( 1.7 ..
    ٠.
           ٠.
                                ••
```

Thus over masty-eight percent of the total sample, examined, showed less than eighty percent of useful seed, and over sixty percent of the samples contained less amount of useful seed than the average percentage obtained for the total number of samples, namely 50.7 p. c.

One can now see easily how the average percentage of useful seed is not sufficient by itself to give a true conception of the quality of the seed examined.

The chief reason of this very low percentage of useful seed in the case of cotton may probably be traced to the system of bnying seed from a local ginning factory where all sorts of esed cotton are mixed before ginning, and a great amount of seed is damaged by steam ginning. A very heavy seed rate has always been found necessary in India in consequence, to secure the requisite stand in the field.

The samples of seets examined were on the whole fairly free from impurities, but many of them, specially those collected from the Deccan, showed the presence of weeds seeds. The weeds seeds most often noticed were of the following plants:—

- (1) Alysicarpus ragosus vern. 'Sheera' (7) Argemone meticana vern. 'Pizala Dhotra'
- (2) Ipomæa sp. vern. 'Bhowri' (8) Rhinchosia minma vern. 'Padçal
- (3) Indigofera glandulosa vern. Barbada (9) Heylandia latibrosa vern. 'Godhadi'
- (4) Commelina forshalen vern. 'Kena' (10) Panicum isachne. vern. 'Sipi'
- (5) Celosia argentia. vern. 'Kurdu' (11) Eragrostis plumosa vern. 'Chiman charo' (6) Amatactus sp. vern. 'Math' (12) Crotolaria oritonsis
  - 5) Amaragras sp. vem. "Mark" (12) Crototaria oritonsis vem. "And Bail"

Conclusion: -Finally it may be worth while to summarise the conclusions which have been drawn during the course of this article.

(1) There is no lack of appreciation on the part of the farmers of the neutits to be derived from choosing seed from the last of the produce and the practice is followed as far as possible with many of the crops.

(2) The seel as sown, though fairly free from impurities, is not satisfactory from the point of view of germunation.

(3) Cotton seed germinates worse than any of the other seed, and this is due northups to seed being bought from local ginning mills. Probably the best solution of this very difficult but very serious question of the supply of good cotton seed hes in what I have described in my first report on the examination of the seed supply of the Breach district as the 'De'ral' system of co-meration. This is a mothed of securing good seed introduced spontaneously by the cultivators of this village with excellent results, and is one of the best examples of the success of a co-operative system among Indian villagers. It samply consists in the cultivators of a village, as a whole, making arrangements with a neighbouring gin to treat their seed cotton separately. Each farmer in the village picks the hest bolls of the see I cotton from his farm and adds it to the lot similarly picked by the other firmers of the village. The whole lot is then taken to Broach, ginnel separately in a local factory, the manager of which has arranged to return the seed to the farmers without allowing it to be mixed with any other seed. This is only possible because the total quantity supplied for this purpose by the cooperation of the villagers is large enough to justify this care on the part , of the gin-owner. The seed after gunning is then divided among the farmers according to their share of the seel cotton and this seed alone is used for the next year's sowing.

This method of co-operating to maintain the purity and quality of cotton seed which has been evolved on the spot as worthy of attention, and it seems as if a similar system introduced absorber in the fresidency is the most feasible method of remodying the present state of things.

(4) Weevil attack acts very prejudicially on the actual value of the seed. Owing to the scriousness of weevil attack in pulse seed, an attempt was made to see whether this could not be entirely prevented by smearing with a heavy petroleum oil in small quantity. While this was injurious to the germination with cereal seeds, it seemed to do no harm to the pulses, and may lead to a satisfactory method of storing these for purposes of future sowing.

(5) We have no special seed merchants, and taking into consideration the general lack of information, enterprise, and capital, 1 do not tunk, it will be easy to induce any private firm to undertake the husiness. The real solution will be found only when the cultivator becomes his own seed merchant. This may be achieved by following the line of co-operation adopted by the farmers of Detral as described above. It would seem extremely desirable that any movement in this direction should be encouraged, with cotton seed in the first place, but ultimately with the seeds of number of the other crops grown in the Presidency. Co-operation among the farmers when once started for one purpose will soon enlarge its scope and take within its bounds other important heads in farming. Already existing Agricultural Association might berhams more in this direction.



S Ag students selecting Seedlings for transplanting

## The Novice's Experiences of Agriculture

BY

#### A. Novice.

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the HIS article has been inspired by the illustration accompling it, reproduced from a photograpa kindly taken by Mr. Godbole of the second very class at the agricultural college, when the students of his own year were toding on the farm, full of the enthrough an apprentice. The students are seen engaged in transplanting onions and the picture serves as a memento to them of their work and ought to recall happy memories when, to beguine their leavine moments during the vacation, they turn to the pages of the Magazine.

"In the sweat of thy brow thou shalt earn thy bread" was the charge to man by his blaker, when He sent him forth into the wide world—a charge whose falfilment as in no one better displayed than in the sweating farmer. The students of agriculture at the Agricultural College are not merely told of this, in the course of lectures, as a theoretical fact; they are apportuned a task by means of which they can personally experiment and learn, for a surety, the lot of the farmer.

Theory constitutes a large portion of the agricultural course but the practical work forms its chief factor. Of all their concerns to the second year students, for example, their little plots are their greatest care, causing them is much anxiety as his own large fields as to a wealthy Soukar. It is the practical training in the farmer's line, that makes the students seeking their education at the Agricultural College to know, when they have presed the course, not only scientific agriculture and how to improve the present methods on scientific principles, but what is more important to know the difficulties and intricacies connected with success in this great industry. The College sends them forth with an education boon of experience—on education which instits into them the right feeling they should have towards the farmer and his occupation.

The toil on the farm results to the students who engage in it that agriculture is not all an easy path to happiness. It teaches them what care and alertness are necessary for real success. They sowed as the monsoon crop-Broach cotton-well selected by Prof. Knight to enable them to realise the care and management of a crop most susceptible to good treatment. They took up the work with alacrity and prepared the land by means of several harrowings and manure till the rains allowed the seed to he sown. Though it was a first venture, the sowing in rows was fairly well done. But all the labour seemed doomed to be of no avail for the rains failed. To help the tender plants against starvation under these circumstances, the students had to make an attempt to conserve at least the little moisture present in the soil. They effected it in some measure hy interculturing the soil. Yet a more timely recourse to this may have proved much more successful and prevented the hard pan that was gradually forming in the lower layers of the soil. Another trouble arose, occasionally, in the shipe of pests which bred ficely; and hence at the end of the year they had to bear the disappointment of a poor cotton yield both in quantity and quality. What has been the lesson? To be prepared for all emergencies and to readily to task their wits to meet them boldly.

The cold weather crop was onions. The seeds sown in clean, well manured and well prepared bed at the end of Spatember, with a regular irrigation at the hands of the students every ten days, were ready for transplantation about the beginning of November. Here again the students put forth their hest energies to got ready a sense of well prepared heds for seedlings to be transplanted and when all was ready the work of transplanting commenced. It may be rightly said that the importance of economy of time, the rapid use of hands and legs, the principles of proper irrigation could never have been better studied than in the course of this operation. And above all the co-operative system on which all the plots were worked at, was a demonstration—obvious in itself—of its absolute need in agriculture. The daily labour of six to eight hours for several days in succession gave the students to know what it means to work in the fields, difficult assuredly yet causing ellest satisfaction to the heart at the end of a good days' work.

For all their endeavours, the plots seemed to be thriving well and appeared to compensate for the disappointment over the cotton crop.

With irrigation every ten days and clean weeding, the whole series of plots had a fine look of greenery. But here again, when almost at the end of their labours an insect pert—the thrips—comes to mar its success. The cause of this invasion is difficult to ascertain but it came at a time when the preliminary examinations occupied the hands and attention of the students. Timely remedy could not be given to prevent its spread and further invasion. Again, a lesson how every moment the furner must atten I to his fields to prevent the force of nature's surprise attacks.

"There's a percental nobleness and even recreimess in work" rays Carlyle. Amely the borden and additionlines of class work, the tarm work required of the stollents has been to them a source of deep concern and they undertook it right hearthy in the hopes of bright prosperts and brilliant success. The persistents to have been especially hard on them, yet their houset work, let us truet, has not been in vain. The nobleness of their work remains. They have attained from it a lesson of world—wate importance—sympathy for the hard pressed lobourers in the fields. This is indeed a matter of constratulation to

them.

# College News and Notes.

TTE Lave to tender an apology to our sub-cribers for the delay in the more of the last number of the Magnaine. The delay was caused by the very late arrival of one of the picture blocks that was ordered. We regret also that the present is not out in time, though for different reasons. The managers and editors have lad very little feature to spray, consequent on the approach of the University examinations. Though late, they lave tried their best not to tax the patience of their reasers by getting the number ready as soon as they possibly could. We trust that this will plead enough for them and that our subscribers will not think ill of us for having kept them waiting.

The pre-ent number wirds up the Third Volume of the Magazine and we are glad to say at this stage that its nopularity has been evinced by the large addition during the course of the year to the list of its subscribers. With this is us, the college activities also cease till June. The college course ended on January 39th, and on the 1st of February the preliminary examinations commenced-much later than usual. They continued up to the 15th, and as the final examinations have not been postponed simultaneously with the extension of the term, we have not had the usual length of time to get into thorough trim for them. The preliminary examinations were held in the College hall. The surroundings and the strict discipline made us believe we were actually in the University. The results give us hopes to see some very good successes in the final examinations, and also a good average on the whole if, as undonlitedly will be done, the best possible use is made of the little time that is left.

The general topic just now is "Have you finished your portion."
This constant reminder, cas to another, does necessarily induce one to
give himself and the questioute, a satisfactory answer as soon as possitle. It is our ardent with that by the 11th of Marcha broad smile and

a sincere "yes" will be the answer of all when they meet at the University for the test mutch. We wish that every one will have pleasant times in Dombry during the examination week.

The special students of all the classes have this year an examination in addition to the preliminary. The examinations commenced on the 28th, February and will continue till the 8th of March. The training of the special students is in every way equal to that of the University ones, an equal standard being also required of them in the examinations.

The short course students have also completed their course and most of them have tared very well in the certificate examinations.

We expect to have among no some more students from Ceylon as the Ceylon government have instituted four scholarships to enable ethnolnats in actionline to receive a thorough training at the Agricultural College here. It makes no proud that our College has been chosen for the purpose by the Ceylon government, and we feel assured that the new-comers will find themselves comfortable here in every respect. We have already two young men from Ceylon who are now thoroughly acclimatised and who have derived a distinct benefit from all they that have learnt of Indian agriculture.

We are extremely glad to see the names of Me-srs. Ramrao Kasargode and H. K. Mehts as Examiners in Intomology and Physics for the Examinations in Agri ulture. While congratulting them, we hope to see them holding the honour for many years to cone. Mr. G.D. Mehta was already last year Examiner in Chemistry and we are glad to see him appointed the same again.

To give a glimpse now at the past quarter, there was nothing in particular enacted except that the students met in a general assembly to discuss and settle upon the principles to be adopted in the distribution of the medals presented by our esteemed friend Mr. Fazal Haque Ahmed, of which mention has already been made in a past issue. As

desired by hom, the methls are to be known as the Ahmed-Mann medals. He also, with the idea of inducing thorough fellow-feeling among students, and also of creating a desire in them for furthering the interests and maintaining the prestige of the College laid down several conditions for competition. The term public-spirit embodies all that is contained in them. He left it, however, to Dr. Mann to adopt the best method for selection of students for the The meeting was therefore called by Dr. Mann for this purpose and it was resolved after much discussion that every individual member of each class should vote by ballot for three men from his class fulfilling the required conditions ; that from these, the first three with the highest number of votes should be selected and that a special committee composed of the three pmfes-ors, Mr. Sahasrabuddhe, the general secretary, and one student selected by the Principal to represent cach class should make the final selection from these nominated he the statents. This principle embles the students to send up for nomination those most nonalar, and prevents any unpleasantness by allowing the staff to give their judgment. There was a prefty great outling ism over the whole affair and among those sent up for nomination by the students. Messra, Bhadkumkar, Joho and Masani were selected as medallists for the B. Ag., S. Ag. and F. Ag., classes respectively. This bonour, the first of its kind among us, engly to stimulate every one of us to put forth our best energies for the glory of our Alma Mater. The honour is a weights one and of just the kind to infine into the students a love for the lustitution, that is trying to make men of them, a sense of feeling and sympathy for their fellows and an endeavour to build up a character, which will command the reverence of all, when they leave the portals of the college, and which will reflect the greatest credit and honour on the institution which has educated them. We have no doubt that it will be the desire of every one in years to come to join in healthy and strennons competition for the prize.

We cannot but offer our heart-felt thanks to Mr. Fazal Haque for his soperme public-spiratedness in making the presentation. Me will be glad to learn of the success with which the first nomination for the med ils lave been made, and to know that the med is are and will ever remain a subset of the deepest interest and great pride at the college. In connection with prizes, we feel happy in having to record the University bonour gained by Mr. C. V. Saue, Demonstrator on the folloge Form. He has been given the Ashburner prize for an essay on the 'Improvement of Indian cattle'. The recognition of the essay by the University is a dictuct proof of the value of the information it contains und the principles for improvement it lays down. Mr. Saue's issuy in the "Incresse of Indian cattle' has been published in the second volume of the Magazine, for which he has extract the prize and it ought to be a matter of great satisfaction to him as it sincerely is to us all muthe further distinction conferred upon him for a very original work.

Soon after the preliminary evanuations Dr. Mann went on tour to the Ratnagiri district for the examination of the hot springs existing there. He was absent from us for a fortnight. He has we are sure collected a mass of material, in the course of his scritinizing examination, which will prove of great value in the line of research.

Mr. Barns will shortly be going home on three mouths leave. We wish him a safe voyage home and a speedy return to the College, full of new vigour and health to resume his scholastic and social duties among us. He is truly the life of the College as much in the class us on the playground, and were it not that we too will he away for the vacations, we would have missed his pre-cace very much.

Afr. Knight has recently studied, after deal of experimenting, a point in connection with the working of the English plough which will revolution onlit the ideas and methods hitherto followed upon. He has found that good ploughing can only be effected by "balancing" the plough. This "balancing" requires a practical study though theoretically it may be put down as the steady and easy working of the plough full on its shoe. The subject has become all important to the students who may be daily seen working at the ploughs on this principle. A new set of ploughs, manufactured by the firm of Rud Sack of Germany, have recently been brought to the Farm and their working experimented upon. Mr. Rud Sack himself has been bonouring us with a visit and giving demonstrations with his ploughs. They have proved their efficiency for our seils and will probably be soon in it troduced.

A scrious ussect post has recently visited our Farm. The thrips have nitroked all the onion plots causing considerable damage. Luckily however, their advent has been when the onions bulbs have on the whole sufficiently developed. The outtorn must necessarily be very much affected. The curse of this invasion is not definitely known. It is in fact the first occurrence of its known on the Farm.

The senior manager and elitor are at the end of their course and will leave as shortly. At least we expect them to do so in the prospect of their expected success in their examinations for the degree. We regret to think of their going away as they were most useful members of the Magazine Committee. Mr. Gokhale, as manager, has been the mainstay of the Magazine, working for it most animonally. His sincerity in its cause may be judged from the success our journal has attained during the year, in the norre using let of emberchers and the vastly improved finances. He deserves our opecial thanks and not less our editor to both of whom we hope we shall have the pleasure of offering our thanks agun and congratabitions in the next number.

Here we ask to be allowed to remind all our subscribers perticultrly the students, that we are in great need of their co-operation for the up-keep of the Magazine. We ask the students especially to codeasour to send in contributions. Sarely, we do not expect elaborate experiences and experiments from them, but they may occasionally had no the course of their observations or their study, something worthy of record. We rely on their making the best use of their habidays in the collection of material for articles which they might contribute. We should be very much pleased to see our students having ancorrely at heart the success of the Maragine.

In conclusion, we thank the returng Committee for their good work in the cause of the Magazine. All have rendered valuable help and they have certainly been well rewarded in the gradual spread of the Magazine.

While going to the Press, we hear with pleasure the appointment of Mr. R. S. Hiromath, B. Ag. in the Provincial service, as probation-

ary Deputy Collector. Mr. Hiremath was a brilliant student of the College and has always contributed to the up-keep of our Magazine. While congratulating Mr. Hiremath on his appointment, we wish him all success in the future. We hope to give a short account of Mr. Hiremath's career in the next number of the Magazine.

#### The College Gymkhana.

We must confess that an air of general passiveness has prevailed in this department during the quarter. It is natural, there should be some physical inertness when the mental activities are put to a severe test. Tennis however affords a good relaxation to the students after a hard day's work. The Reading room even has lost its patrons to say nothing of the other branches of the Gymklana.

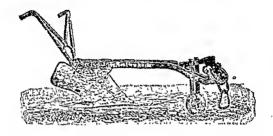
The Debating Society ended its proceedings with the lecture on the 'Manurial resources of the Bombay Presidency and how they can be best utilized " by Mr. V. G. Gokhale, Saperintendent of the Farm.

All the departments of Gymkhana, it may be said, have been successfully managed by the various secretaries to whom general thunks are due for their caergy they have displayed. The task has been by no means an easy one for some of them, considering that they had to seek spare moments for it from their studies. Their work is all the more commendable for it

A final word for the Debating Society. We trust that the stadents will return in June determined to work earnestly for it. The Society is just the place to gain a bureau of information collected by the different lectures, and the only way to do justice to the exertions of the lecturers is for every stadent to do his best to be present for the meetings, and to enter into the spirit of the debates by boldly speaking his sentiments on the subjects mader discussion.

If each student considers himself an important and necessary actor of the Society, we can surely hope to see this Society the best of its kind in all the Colleges in the Presidency.

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1912.

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#### Magazine, Committer

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The Marazine is at the disposal of Professors, past and present students as well as outsiders having special interest in Agriculture. All contributions should be written leadily and on one side of the reares and are subject to such peedful emendations as may be consistent with their ideas and rejected articles will not be returned.

The Magazine will be published as follows -Ist July, 1st October, 1st January, 1st March and contributors are requested to send in their contributions at least one month before the date of publication, "

T. LOBO.

Editor. POONA AGRICULTURAL COLLEGE MAGAZINE

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Poona Agricultural College, Poona, July, 1912.

(Sd.) J. B. KNIGHT, Professor of Agriculture.

S. V. S.

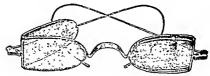
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THE HONOURABLE THE CHIEF OF ICHALKARANJI,

(We present this month the portrast of one of the lealing enthusiants of Agricilianal progress among the Chiefs and Sandirs of the D cent. The Hon the Chief of Lbalkarany has for many years identified himself with Agricultural improvements. He took a leading part in the Provincial Agricultural Conference in Point 1999, he presided at the Marshi Conference organized by the Deccan Agricultural Association in 1910. He delivered the anamal address to the Students of the Agricultural College in the same year, and has continued to show a very keen interest in the College and its devilopment.)

# The Poona Agricultural College Magazine.

#### Editorial.

inc, first issued with considerable fregulation in 1909 has being zinc, first issued with considerable fregulation in 1909 has being yearly, has had reiched its fourth volume. Each year has seen an increase in subscribers, and we thank, also an improvement in the Magazine. Now, it has a circulation in almost every part of India, while cupies also go to Europe and America. The students and staff have good reason, in our opinion to congratulate themselves on this public approcation, which have made the Magazine in financial success. The volume of which this is the first number will be found, we hope, in no way belund its producessors both in the interest and in the value of its contents.

In the present number we should like to rall attention to several articles. The first of these is that on trees made in the draught of various ploughs, by Mr. S. B. Butani, recently Assistant Professor of Physics and Mathematics at the College. To ascertain the amount of work remired to produce a similar result by the implements in ordinary use and by the most improved types is a matter of great importance. There have been, however, great difficulties in doing this. The methol of yoking indigenous implements seemed to make It almost impossible to get exact data in their case. Mr. Butani has, however, worked out a method which seems perfectly satisfactory in comparing ploughs under similar conditions, and by a statistical treatment of the actual figures obtained he has acrived at very import aut conclusions. So far his figures only apply to two ploughs, but we hope that his successor will continue the work, and before long give us material which will place the future development of implements snitable to Western India on a sound basis.

We would also call attention to the paper on the cottons of Guzarat, for which we have to thank Mr. K. D. Kullarni. Hitherto, we know for seimlar close and detailed examination of the kinds of cotten grown in the various parts of the Guzarat districts. General statements have

usually sufficed. But now with the experience and observations of Mr. Kulkurni at our disposal, it will be possible to speak with far more confidence than before of questions relating to the cottons of Gajarat.

Another matter which is of some importance is dealt with by Mesers. Chibbes and Kolwal, transley, the growth of waterplants. In some parts of India, and totally, we believe, in Kashmur, the water plant Trapa lispirosa is a very important culture in the large area of water which occur there,—and found a very valuable supply of fools. The areas of water in Western India are united, but Mr. Kotwal has shown that a nearly related plant of the same genus is also cultivated in the Tham district, and appears to be very profitable. The matter is certainly worth the attention of those who want to exploit new sources of fool supply, and of profitable acticulture.

But we suppose there is no matter or which questions are more of the water-spelp for uniquation in Western Lill. Un. the improvement of the water-spelp for uniquation. Wells form it is greated source of water for this purpose by far. But many wells are failures. Many are stopped because the rocks are such as to dump the energy of the owner of the land. Any apparatus which will not it entire in the least degree to get water with less difficulty is an important acquisition—periodic if it is within the manual of small landowners and farmers. Mr. R. S. founder describes in the pre-ent number a type of simple boring muchine which has been used with success by the Dharwar Honicipality, and which may have some future before it in places which lies under similar produced exactions.

As we write the pre-ent note (July 19th) the greater part of the Bombay Presidency Les had foir min. The Konkan, Guyart, Katlian war have peculie at least of a fair sense. With a large part of the Decon it is far otherwise. Local min has fallen,—but this has been very light. Many parts have not sown any crops whatever, though in a normal year three would have been in the ground by the middle of June. Foller is at famine prices the quotation for Ladii in the Foom laxans bring Rs. 35 per one houlest small handles. Cattle are depicted on he seen lying by the side of some wither main reads. We have beard of sheep bring sold at one arm each, with no layers. And thus the situation is daily becoming more and more anxious. Before this number methes our subscribers we still hope the situation may have changed. It is still not too late to seeme good crops,—but every day the chance decreases.

#### "A New Plough for Deep-Ploughing."

RY

#### G. F. Kentinge, I C. S., C. I. E.

DEEP-PLOUGHING.—The difficulty of ploughing deep by means of direct traction is well-known. It has been estimated that in some soils in Europe it remires 14 horses to plough 1 ft. 7 in. deep with direct traction, and that beyond this number of horses practically no advantage can be gained by adding further horses to the team, on account of the loss of power which must of necessity result when the team is increased. This deficulty is saverely felt in some traces of that Bombay Presidency where the cultivators habitually ploach shoat 10 inches drep with the heavy woolen planch, and use up to 5 and 6 pair of oven to do so. The same difficulty is found in many places by sugar-cane cultivators who wish to plough 1 ft. deep. The introduction of various patterns of turn-weet plough has done much to solve the difficulty; but it his been found that there are some stiff black soils which are very difficult to plough in the hot weather, and that for eradicating during grass (cyno lon dury)on) from deep black soils it is necessary to go deeper than a foot. The difficulty is greatly increased by the size of the clods of earth which are turned up by the plough; and which are so large and stiff that it is almost impossible for the cattle to walk over them. In order to tackle this problem the onestion of steam ploughing had been considered, but the difficulty of finding the fands (Rs. 49,000) for the trial was too great. It was, therefore, decided to try a large balance plough with two greatings, and the plough and regions, as shown in the pictures, were ordered from A. Baire, Lincount (Une), France. The ext was as follows:-

					113,
Two gearings with all acc	es.ori	ies.	•••	•••	1,875
Two small jack serows	***	***	***		62
One (breaking up) balance	e ple	ough (	weight	636	
kilo3)		***		•••	598
Painting, packing, etc.		***	•••		238
Freight to Fombay	***	•••	***		329
		Tora	L Rs.	*14	3,100

The plough has been in use for two months in the black soil area in the south of the Bombay Pre-siency. It has two cables, each 230 vds. in length poining it to the genring; so the gearings can be fixed up about 220 yds. apart, and the plough works slowly from one to the other, opening a furrow 16 in deep and 16 in, boal. It does very good work, and affords an excellent manus of dealing with black soil infested with deep-rooted graces. It offers an easy load with one pair of good bullocks on each gearing. The only thing against it is that it works very slowly. It ploughs 11 gunthes in 9 hours. This, of course, means a short day for the cattle since each pair will only be working for 14 bours; and the working day might easily be extended so that one-third of an acre could be ploughed in the day. The possibility of working a two gang plough in this way will also be considered. Meantime the plough has met with the warm approval of large cultivators in the Dharwar District and many are degrees to hire the tackle at the rate of Rs. Ja day and to work at with their own cattle and labourers. It is at present bring birst out at Rs. 100 a mouth with a man to look after it.

Taking these rates, and the 9-hour day as a working basis, the net alrantage to be gained by oling this plough works out as follows. It will plough 11 acres in 40 days.

Hire of plough for 40 days at Re 3 a day .. Rs. 120 Wages of one man and two boys for 40 days at Re. 1 adar ... ...

Hire of 4 bullocks for 40 days at R-, 2 a day ....

Total ... Rs. 240

Cost per acre ... Rs. 22 (about)

The rates given above have purposely been pitched high, and the figure per acre is an outside one. If the plough is worked for six months in the year and R .. 3 a day charged, it will bring in Rs. 540 a year, or about 174 per cent. on outlay, which will allow amply for interest, depreciation and repairs.

As against Rs. 22 per acre for cleaning land by the plough the cost for band digging is Rs. 40 per acre; and band digging does not go so deep as the plough.

# Water-Supply of the Eastern Bombay Karnatak and the "Boring instrument."

1.5

#### R. S. Inamdar.

This a matter of common experience to find gauge of people often a control from the castern parts of the Karaatak into the western parts to seek than fool. The future of crops induced by the uncertainty of rundal as the cline canso of this. Irrigation facilities are rare in these tracts which, combined with the uncertainty of ramfall, results in careless cultivation. The cultivator will be republiant the old of the year, and contents himself with careless extensive cultivation. The benefit he gets, is in proportion to the labour he speaks over his land. As a result of this we see the off-recurring famines and the emergence of helphess people from these tracts into these which are better off in many respects. In a word, irrigation furthies are necessarily required in those tracts as it is byowl our means to control the

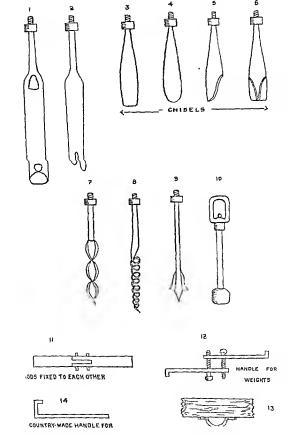
The extension of canal arrigation is restricted in many respects as it is mainly dependent upon great natural reservoirs. Receives to well-arrigation will have to be hall in their absence. But many difficulties have to be faced by the eastern entitiator in sinking in well in one of the strips of his holding. The chief of them may be analysed into two main factors, namely (1) eagled and (2) hoverstainly of obtaining the water even if the wells are sunk. The introduction of the Tayai system has removed much of the difficulty about rapital. The cultivator, besides, will run into any depth to obtain the capital if he is assured of the certainty of the undergound stream. But the main difficulty lies in the latter. Many devices for water-lifts have been made but we know comprastively lattle of the instruments which, with little cost, can trace an underground stream.

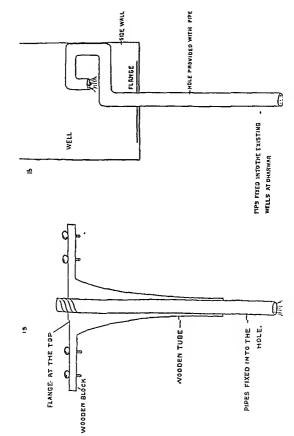
There is a sect of people which professes to understand the flow of underground water. But the attempts they make to indicate suitable successful water often failures. The agricultural department has recently introduced a machine, the water-finder, which is constructed to trace the depth and the force of the underground current. Experiments as to its usefulness are under trial; and if it proves successful it

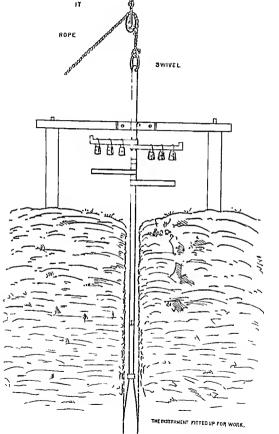
can be said that it will be of valuable help to those who wish to sink wells but who are frustrated in one or more attempts. We notice in many places in the cast Karnatak in Dharwar, in Gadag and Ron Talukas and also near Buppur, wells that have gone below fifty feet without a drop of water in them. In others the water-supply is scanty. Money is lost, labour is wasted and worst of all the cultivator is depressed. If there be an instrument which with lattle cost can make trial borings and determine whether water can be got in a certain locality it will remove the greater part of the difficulty that lies in the rath of the cultivators.

Such an instrument attracted my attention at Dhirwar during the last summer vacution and it seems to give fair hopes. The following is a description of the unstrument. It is being used for the municipal water-apply in Dharwar. It makes beings un lerge and and hence is named the 'Doring iestrument.' The beings are made in the easting wells which are more than 60 feet deep witnont a good supply of water. The scheme was to make beings underground till a foreible current was obtained which would furnish the well with a good water-supply. It has been ancees full in certain cases, and specially one well, 'the public well' as it is called is supplied with a constant flow of water in a pipe three inches in dismeter.

The in-trument itself is of a very simple construction. It consists of a succession of mon rols each ten feet in length, two inches sonare in section, which can be fitted into each other by means of bolt and nut arrangement. At the end of this succession of rols a boring tool is attached. The borns tools are of different shapes modified for different strata. These can be clearly seen from the illustrations. Fig. 1 is a cylinder of strong sheet iron closed by a valve opening upwards, used in sand or love earth. When the tool is working the valve onens and the sand or earth collects in the cylinder; but is hindered from falling by the value It can also be used to clean the holes where chisels have been used. Fig. 2 represents an open auger and is used in clay and stiff soils; Figs. 3 and 4 are used in still harder strata. Figs. 5 and 6 are called S and T nove chisels respectively on account of their shape and are worked in rocky strata. The other parts of the instrument are mere acces-ones. There is a worm auger (Fig. 7) used before the cylinder for loosening the stuff in the Lore-hole; a spiral worm (Fig. 8) for extracting broken rods; and a spring dart ( Fig. 9) for bringing up pipes from the bore-Lole. An iron rod with a swivel at the top as represented in Fig. 10 is fixed at the top end of the succession of rols to facilitate the lifting of the whole instrument at work.







When the work is to be commenced, two posts are erected at a disciplet of six feet from each other and a third is fixed across them at a height of six feet from the ground. If the boring is to be made in the existing well as at Dharwar the third post can be inserted across the well in two holes made in the side-walls. In the middle of this third post there is a clip which attaches the wrivel-red having a chiesel snited for the stratum at the lower end. The clip with a portion of the post is shown in Fig. 13. A pair of handles with screws for attachment as represented in Fig. 12 are then fixed to the swivel-red just below the cross-post, with weights of nearly one munid on each side. Three special handles are then fixed below these handles and are turned round by three men, Fig. 17 represents the whole instrument fitted up for work.

The loring tools are to be changed now and then whonever a new stratum or when the stuff in the hole is to be loosened and removed. A fired from rol will have to be fixed between the swivel-rol and the bering tool when it has worked to a sufficient depth. The instrument will have to be lifted up during these operations by means of a ropo passing over a nuller through the switel.

When the bering is to be mule in firm had no precution against the sides falling in are necessary; but if the bering passes through sand or loose mud a case of papes must be provided. These papes are of the same diameters as the bore-hole and are 12 to 10 feet in length. Before the pipes are lowered down, the bole is widened a little in a slanting position and a wooden tuber two feet long, of the same shape and size and with a square block at the top-mest one being held by a square flenge resting upon the wooden block. Fig. 16 gives an idea of this arrangement. When the lorings are made in the centre of the wells, a U shaped pipe attached to the screw at the top of the flenge and taken along the side wall prevents the hole from hemg choked up by the external dirt. This arrangement is shown in Fig. 15.

The direct advantages that can be had from this instrument are twe. The one is that it helps us to compare the depths of the underground currents at two or three places and to choose the least expensive one. The other depends upon the principle of "Artesian wells". It is a well-known fact that water keeps its own level. Every underground current descends down from a higher or a lower level on the surface of the earth between two layers imperious to water. If one of these layers is lroken, the water forces itself up to a height nearly equal to that of its descent. This instrument reveals to us the

level to which the water can spring. A well sunk down to this level and a bore-hole further famishes the well with the proper water-supply and still the labour is economised.

The initial cost of the instrument is Rs. 400. The degreciation on this at ten per cent and the interest at twelve per cent amount to Rs. 88 per annum. Taking the average working days to be one hundred and twenty, the rent on which the instrument can safely be given with a clear profit of Rs. 60 for the working season, comes to Re. 1-4-0 per day. The daily working cost is the labour spent by three men amounting to fifteen annuas. The capacity of the instrument mainly depends upon the stratum. On an average it is said to have worked five feet in a day at Dharwar. Taking this into account we find that seven annua was the cost of boring a hole one foot deep. The usual rent at Dharwar is Re. 1 a day.

Such is the instrument which seems to give fair hopes if it is tried on a large scale in the east Karnatak. The unitial cost problitists an ordinary entlyator from baying the instrument. There is, secondly, the difficulty of obtaining the work for the whole season within the narrow enrele of a private entitivator. Lastly it is to be tried and demonstrated before its adopted by the caltilators. These things require that the work of trial and demonstration should be taken up by a land-lord, a firm or by the Agricultarial department who alone can carry on the work efficiently. If this nastrament proves a success and if it is introduced into the castern part we may hope to see a less anmber of people leving these tracts and the whole aspect of agriculture changed within a few years.

#### The Draught of Ploughs.

#### S B Butani, M.A. B. Sc.

Late Assistant Professor of Physics and Mathematics, Poona Agricultural College.

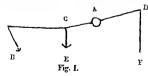
EAGHE question of the draught and even of working is of great is worth while to replace the cheip mon-tance, in deciding whether it worth while to replace the cheip non-tanuver plough still in use almost aniversally in India, by one of the modern type, which is entirely used in Europe and America. It is not altogether easy to compare them; however, the difficulties have been surmounted by Mr. Butani, and he gives an account of his methods and preliminary results in the following article. Owing the his leaving the college, his work will probably have to be taken up by athers,—but he bus, in these preliminary experiments, shown have a satisfactory comparison between the different instruments can be made.—H. H. Man.—H.

The following preliminary experiments were made at the Poora Agricultural College Farm with a view to bring able ultimately to make a comparison between the country plangles and the molern English and American plongues.

Experiments were first made with Blesses. Ransomes Sims and Jeffries' plough marked B. T. 2.

Method of Experimen'.—The soil chosen was medium black soil, under cultivation. Straight lines parallel to now another and at a distance of 5 ft. from one mother were marked on the soil with lime powder; there were 21 sub, so that the distance between the first and the last was 100 ft.

The plough was yoked to the ballocks in the usual way. A dynamometer was used, it was placed at a point A, shown in the diagram below, such that its distance from the point B, the beginning af the month board, was 6 ft.



2

The reading of the dynamometer was noted down each time that the dynamometer was above a lime-marked line; this gave 20 readings in each run of the bullocks, as the dynamometer was never above the first line; sometimes it was necessary to reject several of these for want of certainty; in such cases, the places in the record book where those readines would have cocurred were left blank.

The depths of the farrows at each of the lime-marked lines except the last were then determined; this gave twenty depths in each run corresponding to the twenty pulls, these corresponding to the blank, were rejected.

The distances CD, CE and DF were measured, the list two being the heights of the points C and D above the ground and the first being the total length of the chain used. In all the experiments, these distances were the same.

Results.—Table I shows the results of the experiments. In all, 291 readings were taken and corresponding to them 291 depths were measured. The horizoutal row of totals shows that the poll of 2 cwts. occurred nume times, the poll of 25 cwts. occurred sixteen times &c. The poll of 3 cwts. is evidently the most frequent, being therefore the mode, its frequency is 142.

The second vertical column shows that of the nine pulls, each of 2 cwts., five had a depth of 2 ins. corresponding to them, one, a depth of 2.5 ms. corresponding to the depth of 2.5 ms. corresponding to them, the depths being given in the first vertical column. Of the 142 pulls of 3 cwts. each, we see, eight had a depth of 2 ins. corresponding to them, 33, a depth of 2.5 ins., 51, a depth of 3 ins., 36, a depth of 3.5 ins., seven, a depth of 4 ins., and one, a depth of 4.5 ins.

The horizontal row of means shows that 2.4 ins. is the mean depth associated with the pull of 2 wts., 2.8 ins. is the mean depth associated with the pull of 2.5 cwts. Ac. This is calculated in the number of calculating the mean. For instance, in the case of the pull most frequently found (mode), the mean, X, is found by the equation:—

<sup>142</sup> X =  $8 \times 2 + 89 \times 25 + 51 \times 5 + 36 \times 3.5 + 7 \times 4 + 1 \times 4.5$ .

The horizontal row of standard deviations shows how far the actual depths deviate or differ from the mean depth. The standard deviation in each case is found thus:—Taking the pull most frequently found (mode), the standard deviation Y, is found by the equation:—

$$142 Y^{2} = 8 (3 \times 2)^{2} + 39 (3 \cdot 2.5)^{7} + 51 (3 \times 3)^{2} + 36 (3 \times 3.5)^{2} + 7 (3 \times 4)^{3} + 1 (3 \cdot 4.5)^{2}.$$

The vertical column of totals shows that in all the 201 depths, here were 15 of 2 ins. each, 52 of 2 5 ins. each &c. Here the depth of 3 ins. is the most frequent, heing therefore the "mode"; its frequency is 106.

The second herizontal row shows that of the 15 depths of 2 has cach, below a pull of 2 cwts. associated with thom, I, a pull of 2.5 cwts. associated with it, 8 a pull of 3 cwts., and 1, a pull of 3.5 cwts. Of the 100 depths, of 3 has each, 3 has ea pull of 2 cwts. associated with them, 6 a pull of 2.5 cwts, 51, a pull of 3 cwts., 27, a pull of 3.5 cwts, 10, a pull of 4.5 cwts, and 1, a pull of 6 cwts.

The vertical column of means shows that 2-7 cwts, is the mean pull associated with the depth of 2 ins., 3 cwts, is the mean pull associated with the depth of 2-5 ms., etc. This is calculated in the usual way. For instance, in the case of the mode, the mean, X, is found by the equation:—

$$103 X = 3 \times 2 + 6 \times 2.5 + 51 \times 3 + 27 \times 3.5 + 16 \times 1 + 2 \times 4.5 + 1 \times 5.$$

The vertical column of standard deviations shows how far the actual pulls deviate or differ from the mean pull. The standard deviation in each case is found that: —Taking the mode, the standard deviation, Y, is given by the equation:—

106 
$$Y^2 = 3 (3.3 \text{ m } 2)^2 + 6 (3.3 \text{ m } 2.5)^2 + 51 (3.3 \text{ m } 3)^2 + 27 (3.3 \text{ m } 3.5)^2 + 16 (3.3 \text{ m } 4)^2 + 2 (3.3 \text{ m } 4.5)^2 + 1 (3.3 \text{ m } 5)^2.$$

Fig. 11 shows the relation between the pull as measured on the dynamometer in the direction C D and the pull in the horizontal

direction D G, the direction in which the bullocks may be assumed to apply the force.

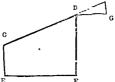
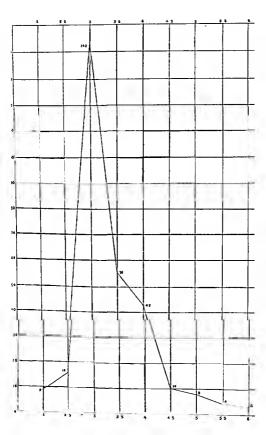


Fig. II.

Fig. III represents, graphically, the frequencies of the pulls. Each small division along the horizontal line represent '1 cwt.; each small division nlong 'as vertical lines represents the number 2.

Table I -Pull of 3 cats. per 25.5 sq ans. or 113 cats. or

				1	3 22 16	t ber e	d racp					
Cwts.	2	23	١,	\$5	١,	43	5	3.5	ē	Lefal	Mean	Star dard Deviation
Ine 2	3	1	s	1						15	27	21
25	1	7	39	6	l					53	3	45
3	3	6	51	:7	16	2	1	.		106	33	3
33		1	36	21	18	5	1		1	29	35	35
4 -		1	1 7	1	10	3		3	2	31	42	92
4.5			3	l	1	l – i	2			4	4 2	53
5 -					2			1		3	4.5	11
Total	9	16	142	56	43	19	8	4	3	291	34	co
Меап	24	28	3	31	\$5	3.53	39	4:	38	31		
Standard Deviation	46	46	20	-37	23	z,	16	41	-21	37		



Experiments were next made with the heavy Poons plough.

Method of experiment.—The soil was the same as before; the plot of ground different but very near. Lines were marked out as before.

The plough was yoked to the bullocks in the usual way. Two dynamometers were used. Their positions are shown by the following diagram:—

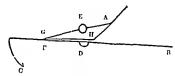


Fig. IV.

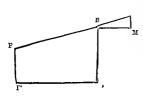
A and B are the places where yokes go; D and E are the spring very nearly one over the other; the distance between them and C the point of the iron piece is 5 ft.; D is slightly halden by the wooden piece, but as observations were made by walking between the wooden piece and one of the bullocks at A, while the plough movel on, no special difficulty was experienced in the making of the observations.

The readings were taken as before; with a little practice, one gets the power of reading both the dynamometers sufficiently accurately, at the same time. Depths were measured as before.

F in the above figure is the point whence the rope F B started. The length FB, and the heights of F and B above the ground were measured; in all the experiments these were allowed to remain the same.

G in the above figure is the point whence the chain GA started. The length GA, and the heights of G and A above the ground were measured; in all the experiments these were the same. H is the point where the wooden piece binds; the distances GH, and HA and the height of it above the ground were also measured.

Calculation of results.—(i) The pull in the rope FB as indicated by the dynamometer D was multiplied by a factor, riz., 1.03. This was calculated thus:—



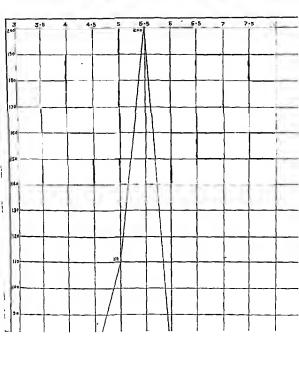
The figure on the side gives the beight FF and BB' of F and BB' of F and B above the ground, as also the distance FB. The pull along BB the book and the pull along BB the book and the being ball the book and the ballocks may be assumed to pull as before) is calculated graphically. The factor is 118/115 at 1-03.

Fig. V.

TABLE II - (A) Pull of \$5 cmts per 28 8 sq unches or 191 cmts or 21 39 lbs per sq inch
(B) Work of 2139 ft. lbs per 100 ft -1 sq inch,
30%0 2 ft. lbs per 1 cult ft

Cwts	3	3 5	4	43	5	53	6	65	;	:5	9	88	Total	Monu	Dorn- tion
Ine 4	3	7	2		l					Į.			12	8.5	-52
4.5	2	2	4	3	3	1	1	ì	I-				13	13	1 0
5	2	2	4	1	5	4			J	l		١.	13	43	*81
53		3	7	33	23	13	9	1	1	١.			97	5	7
6	1	3	3	26	60	59	n	7	ı	1			171	5.2	*6¥
6.5			1	12	13	74	29	18	7	2			117	2.2	Gs
7		١.		1	3	22	15	17	2	2	1		63	6.0	63
75 -		1	•		4	16	7	15	13	6			61	G T	74
8		-	]	-	1	6	١,	9	ս	ա	3	3	18	6.9	86
Total	8	19	21	74	111	21/0	70	70	35	22	1	3	63,7	53	
Mean	46	19	52	58	6	64	66	69	73	7.8	:7	8	6		
Standard Decration	63	83	66	46	57	(3	71	63	63	51	41	,			

(ii) There were two ways of interpreting the pull along the chain GA. Figure VI below shows one arrangement; figure VIII shows



another. In the first case the rod AB to which the bullocks directly apply their pull is nearly vertical; the arrow head near the rod shows

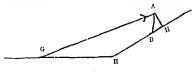


Fig. VI.

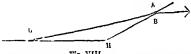


Fig. VIII.

the pull of the hullocks to be determined, when the pull along AG is kuown. If HH', H, A, AG, and GH are kuown, the determination would be easy. In the second case the rod touches AB and matter becomes still simpler. Then the heights of A and B above the ground alone need he known. These were 2 ft. 10 ins., and 1 ft. The distance GA was 5 ft. The factor in this case would be 1.08.

(iii) Each pull along FB in Fig. IV was multiplied by 1.03 and each pull along GA in Fig. IV was multiplied by 1.08. The two were added. These numbers were treated exactly as in the experiments with the Rausome's plough.

Results .- Table 1 shows the results which explain themselves.

Fig. VII represents graphically the frequencies of the pulls, the small divisions on the paper representing 1 cwt. and the number 2 as before.

( Mr. Butani has not uttempted tu compare the two ploughs on the basis of the figures he has obtained, but I think, that even ut this stage some such attempt would be profitable. He has shown that working in the same medium black soil of the college farm, the Ransome's B. T. 2 plough gives a furrow 25.5 square inches in area and a pull of 3 cwts, is required in the most frequent case. The country plough in common use in Poona gives a furrow of 28.8 square inches in area, and requires a pull of 5.5 cwts. in the most frequent case. Thus, per equare inch of soil opened the relutionship is as follows:—

Ransome's B. T. 2-13.22 pounds. Country plough -21.39 pounds.

Perhaps it can be rendered still more clear by taking the actual cases where the furrow was 4, 41 and 5 inches deep, and setting out the actual pall per square inch of furrow opened in each case. We have then as follows:—

Depth. Ransome's B.T.2 pounds per square inch.		Country plough pounds per square inch.	Draft of B. T. 2 Plough, as per- centage of coun- try plough,			
4 inches	13-66	21.50	64 per cent.			
4½ inches	. 12-43	23.74	52 per ceut.			
5 inches	11.67	22.40	53 per cent.			

It will thus be seen that for equal work done, the draught of the more plough is only between fifty and setty per cent of that of the country plough. This is only a first result, but it is sefficiently striking,—and would indicate that little more than half the bullock power would be required with the modern plough that is needed with that commonly in use by the cultivators.—H. H. Mann.)

# Gujarat versus Karnatic Method of Sowing Cotton.

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#### Rao Saheb M. L. Kulkarni.

IN considering the problem of improvement in the present system of agriculture, it is important to observe minutely the existing methods of agricultural operations and to try to introduce the cheapest and the most effective. To stop waste of labour in agricultural operations is as good and as profitable an improvement as to investigate new scientific methods by which better crops can be raised. There are various ways in which agricultural labour is wasted at present. Our cultivators being accustomed to such wasteful methods do not mind the loss they are to suffer. Such losses though they seem slight when taken for each single operation cause a considerable amount of waste of labour when all each operations are put together.

The method of sowing cotton in the Karnatic is one of the instances of waste of labour as compared with the method practised in Gajarat. The two methods are therefore compared here and it is hoped that the cultivators of the Karnatic will soon adopt the improved Gajarat method for sowing cotton.

In the Karnatic, cotton is usually sown by a two conltered drill behind which are uttached two hamboo tubes to the times by thin ropes. The times of the drill make narrow furrows and the tubes attached to the times pass through these furrows and are fed by two men or women who hold the tubes by one hand and feed the same by the other.

In the methed indicated above, not only is there waste of labour but also the seed is put most irregularly in the ground. The two men holding the tubes can be dispensed with, with least difficulty or inconvenience; and this would save at least 8 munus a day. Besides this waste of labour the sowing by this method becomes very naeven. Once of the hands of the feeders of the tubes, is always engaged in holding the tubes. They are to feed the tube by one hand only which causes long gaps in the interval of taking seed from the bag or cloth tied to his waist. The gaps thus caused are sometimes 2 to 3 feet in length and such gaps occur at every 15 or 20 feet in each row. It can therefore be said that about 10 to 12 per cent of the area remains

unsown. Besides, the boles of the tubes being too small, it is very incovernient for the feeders to drop the seeds uniformly at regular distances. This naturally causes thick sowing at certain places and thun at others. Thus the crop on the whole becomes most irregular and as there is no vastem in the Karoatic of thinning a crop as in Guiratt, the plants do not grow very vigorously and do not produce the betyield and of superior quality. The extraordinary leaf-dust which is found in the Kampta cotton of the Karmatic seems due to the very thick planting of cotton.

To avoid the existing Karastic method of sowing cotton, new drdls were introduced from Gajurat at the Dharwar Agricultural Station in the year 1904. These drills are very satisfactorily working since their introduction on the farm.

The only difference between the Gaparat and the Karnatic cotton drills is that the bowl and these of the former are wider and thicker than those of the latter and consequently allow the thick seeds of cotton to pass easily through the tubes. Thus with a very slight modification in the existing seed howl and tubes, cotton can be sown by drills themselves instead of attaching tubes behind them. Both the hands of the sower are free so that he can feed the bowl by one hand while his other band is free to take seed from the seed bag. By this method of sowing there is a saving of one man in the work. Resides, the seeds are put regularly in the seed bowl by both hands alternately thus causing no gaps in the row.

Sometimes objections are raised by cultivators to sowing cotton seed direct through the seed bowls for the reason that the times make very deep furrows and the cotton seeds are huried very deep in the ground and consequently do not germinate well. It is true that if the cotton seeds are buried very deep they do not germinate well especially in beary lakek soils. But the deep falling of the seeds can be avoided very easily by inserting a ring made of cloth or a piece of coir or string at the end of the times. This does nut make the furrows deep at all and the seeds are sown at the required depth only. In this way very regular sowing and even germination of plants have been secured on the Dharwar Agicalitani Station every year. The sowing of cotton seeds in this way direct through the Lowls, is not only economical hat increases the yield owing to the evenness in sowing and the absence of long rup-.

On the Dharwar farm there are now certain trained men who can mnage both to drive the ballocks and sow the cotton seed themselves. There is however fear of the rowe being very crooked and hence the work needs expert skill.

Among the methods indicated above the 2nd (viz. the Gajarat) seems to be the mere economical and convenient. It is therefore hoped that all cotton cultivators will adopt this simple method by substituting a bowl with wider holes and thicker tubes to the present drills. Messrs. Kirloskar Bros. are manufacturing cast iron seed bowls with suitable iron tubes for sowing various eizes of grains from rals to groundants.

The drills used for sowing cotton on the Dharwar farm are always open for inspection. Cultivators are invited to examine these drills and get all their doubts cleared by the Saperintendent who is always ready to solve difficulties.

# Shingada (Trapa Bispinosa) in the Thana District.

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### Mr. T. R. Kotwal, B. A. LL, E.

N the Agricultural Journal of India for January 1009 pages 93,04, Mr. W. H. Harnson has given a short note on the Shingada caltivation. He has given the chemical analysis of a sample of the flour of the kernel of the Shingala. He has very briefly described the manner of its caltivation as given in the Dictionary of Economic Products by Watt. His closing remarks are. In view of the fact that the nut is untritions and common throughout the country its cultivation may be recommended as forming a stand-by in bid seasons when crops might altogether fail."

Professor H. M. Chibber is currying out the suggestion in practice by making experiments of Shinga is cultivition in the Poona District. A personal interview with him on I an opportunity to see the plants in the Ganeshkhind Botanical Garlens at Kirkee which were shown to me by Mr. G. B. Patwarlhna, led me to make equiries, about its cultivation in the Tanna District, during the Easter holidays. The Revenne Department keeps a list of the tanks and lakes in each village. This furnishes ready information to any one who wishes to extend the cultivation. In some places the tanks and lakes in a town are owned by Manucipalities and they derive a revenue from the cultivation of Shingada, Poisar, and Kanals (Lotas).

The writer discovered in his enquiries that the Bhiwandi Municipalty derives an annual moome of Rs. 10/- from one tank, whereas the Thana Municipality derives an income of about Rs. 2500/- for three years, as a result of competition among the growers of Shingada, when the original income from about 5 tanks was Rs. 150/- a year, All this indicates that the potentialities of the cultivation of Shirgada in the Bombay Presidency are not a negligible quantity.

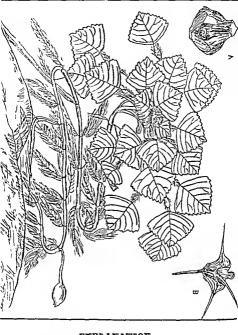
At present Shingadas are grown, among other places, at Dadar (Bomhay), Matunga, Mahim, Panwel, Thana and Bhiwandi. The enumeration of places is by no means exhaustive.

The Thana and Bhiwanda Manicipalities had taken written contracts from their lessees and the lessees pay the instalments without default. In Thana ahout 10% are deposited by the lessee and this deposit is taken into account with the last instalment and the balance is recovered by twelve equit monthly instalments. For the last 7 years one man named Debotal Perdeshi is the lessee. He is a man from Northern India.

Probably the industry was introduced into this District after 1880 as the Gazetteer of the District makes no reference to the calibration of Shingada. The Bombay Gazetteer newly published does not also mention Shingada in the index.

Seed:—Probably the seed was introduced into Bombry and Thana from Northern India by the Perdeshies or Bhayns. In my school days about 1881-82, my impression is that there were Shingadas in the Bhuwandi tank, which I visited this Evster in order to see personally the present cultivation. At present the Flana and Bhiwandi califvators hring their seed from Dadar. One cart-load of the fresh plants or creepers cost Rs. 251/- or Rs. 2 to 21 per head-load of the creepers. With proper care after the first cultivation, the grower of Shingada has his own creepers for the next season. Over-ripe fruit drop in the mad hat sprout up again and are nexful for fresh cultivation. It is said that the over-ripe fruit drops after Ashwin (November)

end spronts up in Falgun ( March ).



# EXPLANATION. Main figure—A plant of the spineless variety;

A. Immature fruit of the same;

B. Mature fruit of (Traps natans), Kashmir variety,

Preparation for Cultivation:—The cultivators remove all moss from the tank and all grasses and clean the tank. The cost of this is 4 or 5 annas per lahourer per day and the total cost depends upon the area of the tank available for cultivation, but cleaning cannot be neelected.

Cultication:—The creepers are thrown in the water at a distance of about 10 ft. from each other. As the creepers have a laxariant growth, if put too close to each other, they get entangled and check arther growth. They then require thianing. Inexperienced caltivators waste their money in haying too many of these creepers, and at times those who have a stock of these creepers, refase ta sell any quantity less than a cart-load.

Growth:—The plants are thrown in the tank about the beginning of Ashalh (Jane). The plants begin to pat forth blessom in Bhadrapaia (Angast). The nats begin to form in Ashwin (October, November) onwards and begin to ripea from Kartik (November) and resease lasts from two to three months and even continues till Magh (February).

Field:—In the first two or three months the daily yield in ane of the Thun tanks was two to three sacks a day. I could not ascertain the proportion of the area to the amount of yield of the crop. The informants could not be definite on these points.

Price and Market:—The Shingadas are sold green and raw in the towns of Thana and Bhiwandi or purchased by contractors from Bombay. The price is about an anna per pound. There is a good demand for the nnts.

Persons who culticate them:—In Theme and Bhiwandi the Perdeshies from Northern India alane, or in purtnership with others cultivate Shingrides. They have brought their knowledge and experience with them and have thus introduced a new crop into this District.

Enemies of the Crop:—In places where the tanks are shallow and the people ignorant and rude, the crap is in danger of being carried way in small quantities by thieres regularly. Where the water is deep and the tank has tortoises in it, these latter eat the leaves and fruits when tender and raw and da great damage to the crop. There are insect posts to the crop which cat up the creeper, or eat the leaves and damage the weeds and thus lessen the crop. The insects are known to live gregariously and are called Kala Kid (Black-worm), Lalwa, &c.

I was not able to get a description of them and I had not time enough to investigate the matter further. The remedy as explained to me was the sprinkling of the tank with a small quantity of oil or Karauj seed.

The buffaloes when they enter the tank for a bath or a swim, damage the creepers by tearing them to pieces. Other cattle or sheep are not known to do any damage to the crop. Horses and usses feed upon the creepers in the green or dry state but they would not wet their feet to eat the crop.

Whether the crop will spoil the water:—At Bhiwandi and Thana when I visited the tanks, cattle were freely drinking water from the tanks covered with Shingada crespors. Opinion was divided as to whether the water would remain fit for human drinking purposes in a tank where Shingadas are grown. The best solution of this would seem to be to send the water for chemical analysis to get the matter pathogridate of the true of the matter pathogridate of the true of the matter pathogridate of the matter pathogr

Extent of prof.:—From conversation with the notaal growers of Shingada in Bhiwana't and Thana as also with the Municipal servants and other gentlemen I ca me to the conclusion that an ordinary tank as is seen in Indian villages woold yield Shingadas worth at least Rs. 300/- and calculating all costs at Rs. 200/- the net income is likely to be about Rs. 100/-.

Materials required for cultivation:—When the tanks are deep the cultivator coquires boths for removing the moss, for convening the creepers, for collecting the finit and for removing the fallen leaves of trees along the bruks of tanks. He requires a few bags or baskets for collecting the fruit and for carrying the crop to the market. A shed to watch the tank would or would not be a necessity and creding to the local circumstances and the nature and extent of the tank. In the Bhiwandi Taluka the names of several villages were given to me where there are suitable tanks for Shingarda cultivation.

The thorns of the fruit which drop down in the water are a source of trouble when the lake is shallmy and a man goes walking to collect the fruit. The covering of the creepers keeps the water of the tank very cool.

I have collected all this information on the spot first hand from the very cultivators of Shinguda and cannut close the account without mentioning the incident in Thaia in my conversation with Dhokal Perdeshi. At first he stated a few facts but got suspicions that I was collecting the information from him with a view probably to compete with him in the contract, or that I had some sinister motive in view and nothing could convince him that I was anxious to tell him of the sources from which ho could get good creepers to improve his crop and prevent it from deterioration. My thanks are due to the Municipal servants and the Municipal connecliors who helped in introducing me to persons from whom I could get the information. I have narrated the above incident to show how delicate a task it is to gather information on any matter without raising the suspicions of those engaged in the industry.

# Notes on the Cottons of Gujarat, and their Possible Improvement.

BY

K. D. Kulkarni,

Cotton Supercisor, Northern Dicision.

URING the last two years I have had exceptional opportunities of visiting nearly all the unportant places in Gajarat and Kathiawar where cotton is grown, in connection with the cotton survey which is in progress. The notes taken during these trips, though not forming a continuous story in any way, may be found of some value and are given practically in their miginal form with this hope and anticipation.

As the cotton is of the best quality and pays better than jourar, cotton after cotton is taken for a long time by the people in this tract. The yield per acre is 600 lbs. of seed rotton.

The only improvement that seems possible in this tract is the adoption of a regular practice of careful seed selection.

5. Narsari and round about Jalulpur.—Western eide of the railtay.—Cotton of this taluka is grown on soils that are lighter in colour than the eastern tract, and the fibre is not so long or fine as that produced at Narsari. But it gives a little bigber percentage of lint and those who care less for quality prefer this cotton. A higher ginning percentage is found in the seed cotten produced in the Era and Bhutsad villages especially.

#### Broach District.

Jambusar Taluka.—The soil is more than one-third gornt in
this taluks, the remaining nrea being of the black type. Much of this
black soil is situated to the west of Jumbusar, while the eastern and
northern parts of the taluka are fer the most part gorat.

In gornt lands, cotton is generally grown in Jane. The lands are easily drained. In these lands cotton is rotated with  $\delta sjr$ , or till and kodes.

In the black soils, cotton is generally grown at a later period when opportunity occurs in the rains. In these lands, cotton is rotated with journ. The distance between two rows is from twenty-foar to thirty inches. The type of cotton is usually ghopher i mixed with a few plants of Deshi. The yield per nero varies from 240 to 600 lbs. per acre.

Here no perennial variety is grown, nor is any irrigation given to cotton. As the cotton grown here is mostly ghoghari, there seems considerable possibility of improvement by growing fine Broach cotton in the black soils, while Cambodia will probably be successful in gernt soils.

 Amod Taluka, —The rainfall here is greater than that nt Jambusar. The land is mostly black though the gorat or malcon type is met with.

Cotton is generally grown at the same time on both types of soil in the month of Joly, either by a Tirifn or by n local seed drill having a distance of twenty-seren inches between two conlters. In the western part of the tailast the land is generally salitish.

In gorat lands cotton is rotated with bejri or til and korda, while in black soils it is rotated with lang, wheat or shall jocar. Formerly it was usual to keep the lund fillow frequently, but nowadays, owing to high prices of cetton many cultivators grow cetton without any rotation whatever year after year.

The crop is generally ghophari slighty mixed with Deshi. The yield per acre varies from 200 to 250 lbs. The same remarks as to the possibilities of improvement already made on the Jambusar taluka also apply here.

als. Vagra Taluka.—The land from the Nahier village of the Amol Raha to Vagra is black. Cotton here is neally sown late. Lang, shalu jouar, and wheat are cultivated. Cotton is sown by means of seed drill with twenty-seven inches between the coulters. The rain is smaller in amount than in Amol hat sufficiently distributed for the growth of cotton.

The cotton grown is better in feel and length than that of Jambusar and Amod, as the cotton is mostly De ski mixed with phophari. Here the cotton crop is moderate, the yield varying from 200 to 450 lbs. per acre.

Here fine Broach, selected both for quantity and quality at Surat, is likely to meet with success.

4. Vagra to Broach.—In this tract cotton is rotated with lang, wheat or shalu journ or sometimes a fallow or "partial fallow" system is observed. The partial fallow system means that the laud between every two rows about four and a half to five feet is kept fallow, in which in the following year two lines of cotton will come. Thus, a cultivator takes cotton year after year without any necessity of any other rotation.

From Vagra as we approach the boundary of the Broach taluka, it is observed that there is continuously less mixture of yhophari found with Deshi. Sometimes people grow the so-called gundi-ghoghari on account of its higher ginning percentage.

In the Broach taluka, the land is generally black and here a fallow system is practiced. The cotton crop is Deshi Broach, mixed with ghoghari. Along the Narlada river the land is lagayat.

The yield per acre varies from 240 lbs. to 600 lbs. The cotten crop after fallow is better than that after journe.

Looking to the soil and climatic conditions, fine Broach and No. 1018 P/G (Broach X Broach) selected at Surat are very likely to succeed here. Cambodia ought to be tried along the alluvial deposits of the Narheda river.

 Ankleshuar Talula.—The land is generally black, but is nneven, and is quite a change in this respect from that in the Broach taluka.

Cotton is generally rotated with journer, and the yield varies from 200 to 500 lbs. per acre. It is mostly of the Deshi variety mixed with ghophers in some fields.

In Hansot, at one time, wheat was chiefly grown, but now-a-days owing to the high rates of cotton, people are growing cotton on wheat lands also. Fine Broach and fresh Navsari seed are likely to prove a success in this taluka.

#### Baroda State.

(1) Myagaum.—Round about Myagaum, the cotton is of a similar kind to that caltivated in the Broach district. The soil is black like that of Surat, while the cotton crop, in good years, yields six hundred pounds of seed cotton p.r acre. The quality is a little inferior to that grown at Surat.

A two feet space is usually left between the rows of cotion, but sometimes the distance is greater, when another crop, such as rice or lodra, is taken between. This method of taking rice in cotton and keeping the distance more than two feet is peculiar to the tract we are disca-sing. Sometimes the land is k-pt completely fallow for one year and sometimes partially by taking cutton in rows ten feet apart.

A slight mixture of ghogiari is found here in the Broach Deshi cotton.

Journ is always rotated with cotton though not exactly in alternate years.

(2) Dabhoi.—The tract round about Dabhoi is of black clay soil.

Here the amount of ghoghars cotton in the Broach locally cultivated is much greater than in the neighbourhood of Myaganm. Here, as a rule, the ginners insist strongly on white colour and high ginning percentage. As a result ghoghars, which possesses these two qualities is mixed intentionally. The yield per acre is about six hundred pounds of seed cotton per nere.

The length and fineness of cotton of this locality is inferior to that of Sunt, and, hence, there is much scope for seed distribution of fine Broach, the land in some places being quite like Naveari. The only difficulty that will be experienced in distributing the improved seed of fine Broach is the slightly lower ginning percentage given by fine Broach as compared with the local cotton.

(3) Kalol to Kadi.—This tract grows wagad cotton. It has not remained pure, as people for the sake of improving the colour of wagad, mix latio seed when sowing, and latio cotton being whiter than Wagad, the fibre looks better in colour. Also, in the neighbourhood of Kadi there is a mixture of jari, but this can be attributed to the Wagad seed being brought from gios, and not to its being mixed intentionally, as this variety has got the disadvautage of early ripening and thus requires separate picking. Furthermore, it has got a short fibre and thus makes the whole to to favored irregular.

In this tract the cultivators water the cotion crop like Batla and Dhola of the Ahmedahad District, and the yield of seed cotton of the irrigated crop is from oas thousand to fourteen hundred pounds of seed cotton per acre, compared with six hundred or even only five hundred pounds in the dry crop area. The ginning percentage is also thirty fiva and so the oally improvement requared here is selection of seed so to avoid the mixture of jars from the fields. The land is a sandy loam. The rotation observed is wheat after bajiri or banti in one year and cotton the next year.

(4) Kalol to Meisana.—The tract from Kalol to Meisana grows cotton less and less, as Meisana is approached. The variety grown is argad with a mixture of latho but it was observed that there is half to half mixture of latho with lagad near Meisana, while in the neighbourhood of Kalol the amount of latho is very small. The land is like that of Kadi, that is to say, a sandy lean near Meisana while the cotton crop here is also watered like that of Kadi. At Meisana we find here and there rozi cotton growe in rows wide apart with bajri in the middle.

Near Kolol the land is less sandy than in the neighborhood of Mehsana and cotton is not irrigated, nor does it seem that there is any necessity for it as the land is a clay loam.

From Kalol to Mehsana castor is grown in the lines of cotton as journ is grown with cotton in Khandesh. Of course as long as these

plants are far off they do not inconvenience the main crop and also may be beneficial as giving the benefit of a slight rotation where cotton after cotton is taken, but here in some fields castor is grown so much that it stunts the growth of the cotton, the main crop.

The ginning percentage of cottun near Mehsana is 34-35, while the length of the fibre is also good. The unly suggestion to be made, therefore, is to observe selection of seed morder to avoid the slight mixture of jars and malthio, though the mixture with these inferior types is less than at Kadi. The yield per acre of dry and irrigated cotton is like that of Kadi.

At Mehsana, one peculiar method of cultivation consists in keeping the usgs i cotton for two years, by cutting the first year's crop after harvest, and thus saving the trouble and expense of cultivation, while the vield also is not found inferior to that of the first year's crop.

Here the rotation of bajre-bants followed by wheat and next year cotton is the same as was observed at Kadi.

- (5) Patan.—The tract round about Patin grows very little cotton of the usyad type and here also admixture with lalio is ioteotionally mule to improve the colour of usyad cottoo. The chief crops of this place are tobacco and wheat, while dajri, tur, usal &c., are mixed and sown in one field as in the Borsad talukn. This, the people say, pays better than cotton. The winter being severe here, the cotton crop becomes stanted as in the Dohad taluka of the Panch Mahals and thus this is hardly a place for the extension of cotton maless it be with an early ripening variety.
- (6) Wadnagar.—The soil in the tract from Mehana to Wadnagar.—The soil in the tract from Mehana to Wadnagar.—The land is not specially suited for cotton, and the winter being severe here, the crop will softer. The only types of cotton which seem likely in give success are the Cambodia and the burit, with or without irrigation. These are at any rate, worth a trial, as they can be harvested before the very cold weather sets in.

#### Kaira District.

Thasara.—Round about Thasara, the chief cultivation is that
of rice. Most of the land is specially prepared for this crop alone,
while the remainder usually bears tobacco or bajri, the latter in
combination with cotton.

Tolucco grows here without irrigation on account of the heavy character of the soil, but if the late rains fail, the crop suffers. Bajir and batto are grown between the lines of roxi cotton. This cotton is not so hushy as many others of the local varieties, and hence gives more space for these cereals. As there are no wells in this neighbourhood, irrigation is not of the question.

The soil is Goradu, and heavy. From about thirty feet deep, there is heavy water bearing quicksand, and in this it is almost, impossible to make wells.

Kuhanmi or Broach cotton does not grow well here as the plants often decay, while rozi can withstand the conditions. If cotton is sown late in Angust here, the foots spoils the crop before it is ripe. Rozi, if damaged in this way, again improves in the following year, and it can also be sown in July.

If Kakanmi (Broach) cotton be sown in goradu soil this becomes very hard indeed, and moreover, this soil is the home of white ants, which do very much damage. The soil becames so hard as to allow little cultivation after the rains are over. If Broach cotton is sown early, therefore, it decays, as has already been mentioned; if it is sown late, it gets no after cultivation. The yield of Rozi here is only two hundred pounds per acre in good searns.

(2) Dakor.—The soil here is between black and goradu. The crops are similar to those of Thanka and the same remarks are applicable here.

On the way from Dakor to Anard the area under rozi cotton increases more and more up to Luand, but from Anand to Agas on the Cambar line it Jectrases again.

(3) Borsad.—The land round about Borsad is goromti or clay goradu.

The crops taken are totacco, under well irrigation, and bajri and hodra with rosi cotton in rows.

The people will not grow any cottou Lere, as from tobacco they get trebe the return they obtain from cotton, while dry lands can grow batto, it!, tur, ambad &c. in case field above, to n value of about Rs. &Coper acre. So that annual cottons do not give n higher return than the ordinary dry crops, while the tree cottons do not yield so well as tolacco even nuder irrigation, nor can they replace root on account of their

more spreading habit and the necessity of water. The land is also foll of white ants and therefore annuals will not grow well. So for these fertile lands, cotton that will not require wathing and will give more than Rs. 1001- per acre is necessary, and such a kind as not obtainable.

Pour people having dry land grow rozi as in gives them some cash while from the same area they get all the foor staffs required for daily consumption.

(4) Petlad and Sunare.—The land of Petlad and Sunare is like the Nadad tobacco soil and wherever there is well irrigation, tobacco is grown.

Hozi cotton is grown, here and there along with bzjri, while only one field was seen of Kahanmi (Broach) mixed with rozi and tur at sanare.

Here the people are very keen on tobacco cultivation and this crop is even grown in a portion of the dry lands. In the remainder, they prefer to grow bajri and rozz cotton together, rather than Kahanmi (Broach) cotton alone, as they thus obtain the grain required for their homsebald use.

#### Cambay State.

(1) Gudil.—The land is either goradu, or clayey and black goradu soil is used for cotton while the black soil grows either wheat or cotton us the season allows.

The black soil has a subsoil of goramti and below that is the sand layer thirty feet from the surface. On this land cotton is grown only very rarely, the heavy rains giving no opportunity to sow the black soil.

The surrounding lands are saltish and are used for pasture, but only gmw stunted and inferior grasses.

The cotton grown on the geradu land here is lahanmi bot has a short fibre like latio of Earla. Narsari cotton will, I think, grow here well. It is said, however, by the local cultivators that efforts have heen made to grow Narsari cotton here but it did not yield pmperly. The cultivators being Gameias, take the bolls to their houses in order to remove the cotton, and thus save the cost of picking in the field a little. The shells of the bolls are used after boiling for feeding buffaloes.

(2) Khakehar .- The soil of Khakehar is both goradu and black.

Navani seed from Navani was distributed here some years ago, but the variety is not continued, people saying that the crop does not pield so well as kohanmi. Distance from the original locality may be the cause of the decrease of yield, but it is evidently a matter for study and experiment. The half from and the local kahanmi here is 400 pounds per acre. The land from the may to Gudili salmet salt, and beyond this pount, the cultivation of cotton commences.

(3) Cambay to Tarapur.—This tract is a goradu tract in which rozi cotton is grown here and there. As at Borsad, tolacco is a very profitchle crop in this soil, and there is, therefore, less chance of success for cotton either annual or personial.

#### Panch Mahais.

(1) Moraliz to Rabiati.—The tract from Moraliz to Rabiati is mostly compreed of medium hlack goradu, and muranti soil and cotton on be grown in these places though once is now grown. Galarat cotton does not seem suitable to these places on account of the extreme cold and its effects an each late ripening varieties, but Khandesh cotton being early can be extended on a large scale.

The enccessful introduction of Khandesh cotton on the Dohad farm shows that seed can be freely distributed in this district in places where cotton is not at present grown.

- (2) Morali to Korat.—The soil of this tract varies from medium black to light black with a little goradu in the neighbourhood of Korat. The tract will grow Khandesh cotton very well, but not the Gujarat varieties on account of the shallowness of the soils. The rock is not much more than one foot from the surface in any place. Furthermore the winter is very cold, and damages the crop when in the flowering condition. For the present no cotton is grown here at all, but wheat and gram are taken as rabi crops in deep soils, while the light soils are only used for bharif crops. These light soils are suitable for growing Khandeeh cotton in place of the awail harif crops.
- (3) Derol to Chapamer.—From Derol, Halol is first reached where the land is stughtly of the goradu type and more entiable for rice, bejri, tur &c. than for cotton, while frost bere is likely to be as injurious as at Dohad. But round about Halol, the land changes and consists more of a black heavy type of soil while the Chapamer Hills protect the tract from sweeping cold winds. Cotton is, therefore cultivated here with success.

The crop yields here 400 to 500 lbs. per acre. The variety grown is kahanmi and the ginning percentage is 35 to 37 per cent. Broach Deshi of higher ginning percentage may sait here, while for the mountainous tract round about Chapiner, where it present there is only forest, Khandesh cotton can be grown which ripens early that is to say, before winter.

Where the cotton crop is grown here at all, it is almost taken annually as it pays well, and as a result no attention is given to rotation. Sometimes one row of tur to every four rows of cotton is grown while a mixture of cotton with ambad, is also very common. Here also, as in the Breach District, coarso rice is grown among cotton, but mostly broad-casted and not as in Broach in good rows.

As there is good water here, and the land of light colour, watering cotton like Batla will probably increase the yield two-fold.

(4) Chapaner to Chapaner Road.—The soil of this tract varies from light colour and texture to a deep black clay. The Halol tract is described above, while from Halol to Chapaner Road, there is cotton only half the way. The remaining four miles up to Chapaner Road are not caltivated and yield hut grass. This tract, it is said, is submerged every year, but such places when reclaimed ought to yield very good cotton. Here, enterprise is required. From Halol to Chapaner Road, the land becomes blacker and blacker, and thus there will be less necessity of irrigation than in the tracts previously dealt with.

( To be continued. )

#### Notes on the Water Requirement of Crops.

V. A. Tamhane, L. Ag.

N hot and dry countries like our own where the rainfall is scanty, precarious and confined to a short period of less than four months, nothing is so important as to know the water requirement of crops. Manures play only a part of second importance to that of water, and it may be accepted as a truism that the crop obtained is more often determined by the water available than by lack of manure. The object of many of our tillage operations is the conservation of the moisture in the ground for the service of the crops. Indeed this forms the fundamental basis on which the whole practice of dry farming depends. It was therefore with the object of finding out what should be the least amount of water in a soil to make it fit for the growth of crops that I was given an opportunity of doing the following experiment. The results obtained were apparently abnormal and widely differed from those of many of the authorities on the subject. I have, however, no doubt of their accuracy, and the details of the experiment will presently be given.

In the rabi season when the effects of rain were almost over, a few samples of surface soil (black cotton soil ) were taken from the cultivated land of the agricultural college farm, Poona, and the total amount of moisture determined in them. The average amount of moisture was found to be about twelve per cent. The land was sown with shalu (rabi journ) and it was intended to find out the least amount of water necessary to be present in the soil for the proper germination of the jowar seeds. Accordingly a sufficient quantity of the soil was thoroughly dried and put in four pots of the same size. The quantity of soil put in each pot was equal in weight but the amount of water added to each pot was different. The soil in the first pot was moistened with five per cent of water, that in the second pot with ten per cent of water: the third not contained soil moistened with fifteen per cent of water while twenty per cent of water was added to the soil in the fourth not. An equal number of selected joucar seeds were then sown in each pot at equal distances at a depth of balf an inch. Each pot was then kent under a bell jar and all communication with the outside air was cut off by pouring a little water into the vessel in which they stood so as to close the mouth of the bell iar. In this way unequal evaporation

of the water from the four pots was avaided. It was then expected that the seeds in the third and fourth pot would undoubtedly germinate since the soil in both the pots contained more than twelve ner cent of water, the amount actually found in the cultivated land. The main object, however, was to ascertain whether the seeds in the first or at least in the second not would germinate. If the seeds in the second not had germinated, another experiment would have been started to find ont what was the minimum amount of water between five and ten per cent necessary for the germination of the seeds, but the results of the experiment were curious, as not a single seed in any of the four pots germinated. I could not at first explain why the seeds did not germinate in the third and the fourth pot. I thought some serious mistake must have crept in and the experiment was repeated, this time with special care, but the results were the same and again not a single seed perminated in any of the four nots. Another series was then commenced using, however, this time twenty-five per cent of water in the first pot, thirty per cent in the second, thirty-five per cent in the third and in the fourth forty per cent. The results of this experiment were most satisfactory, all the seeds in all the four pots germinated with great vigour and energy.

All this goes to prove that the seeds in this case require at least tweaty-five per cent of moisture in the soil. This seems apparently contrary to the actual state of things. The land was found to contain only twelve per cent of moisture and this was enough for the germination of the jowar seeds sown in the field. How is this anomaly to be explained? The explanation would not seem to he difficult. The total amount of water require! for germination of the seeds may be more though at any particular time not more than twelve per cent can he found in the soil. The difference between twelve per cent and twenty-five per cent would be made up by the continual rise of the water in the soil from the lower layers, which contain a much larger quantity. If this explanation is correct, it would appear as is actually the case that while in deeper soils twelve per cent of moisture in the surface soil may be sufficient for the start and development of a crop like jowar, the same amount of water in very shallow soils would not suffice, and the seed would probably not germinate.

## 'Pan' Cultivation at Ramtek near Nagpur.

### V. G. Patwardhan, B. Ag.

URING my visit to Ramtek last December, I found that pan cultivation there is rather different to that practised here, and perhaps a short account of it would prove interesting.

Pan is extensively cultivated at Rambek a place twenty miles from Nagpur; also at Sawner, Baduera and other places in the same part of India. Ramtek is specially noted for its pan cultivation which is of very long standing and is very profitable to the cultivators who are locally known as 'Baris.'

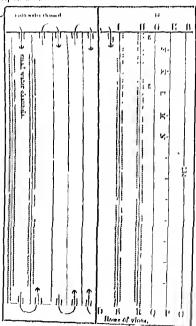
The soils that are generally selected are Medium black, Loam, Murum, Besur and Barad. The soil that is hest enited for pan cultivation is light, prones, well drained and rather of a yellow colour. The black cotton soil is rejected owing to its sticky character and defective drainage. Solid murum is found at a depth of five feet. Blace echists are found abundantly round about. Any virgin land or an area fallowed for four years of the above character answers the purpose very well. In black cotton soil the cultivation does not thrive well. The roots rot, the yield is small and moreover, the pan obtained is of an inferior quality both in size and colour.

The fields are not usually ploughed or harrowed as a preliminary operation, to secure a good tilth. They are simply levelled. This levelling is a necessary operation in pan gardens. After levelling the land, the next chief operation is the erection of a mandap. Neither pangara (Eruthrina indica) nor sherri (Sesbania eguptiaca) is grown as support for the vines nor plantsins for shade, as is customary in the Western Deccan. Small split sticks of bamboo go above the mandap and are tied to it from the supports. The erection of the mandap is a very laborious and costly operation. The land is measured breadthwise and lengthwise and wooden pegs are fixed at a distance of two feet each way; and the rows are marked over the whole area. No hed system is practised and no cross rows are made. On the rows the strong wooden posts at a distance of ten to fifteen feet apart are fixed. This distance is known as a kuntar and the whole row lengthwise measures such fifteen to twenty kuntars, so that the length covered by one row is from one hundred and fifty to three hundred feet; and there are 240 to 300 such rows in one good pan garden. The distance between the rows is two feet. Six such rows make up one ' lamb' (12 feet by 150 or 12 by 300 feet); so one pan garden known locally as 'tanda' contains

forty to fifty lands. The following sketch gives the defails of a lands. Two lambs or shown

A B O D is one tout.

Distance C P trons hunter. If 1, 4th dec, are double rows of vines; P, R, L, M, N dec, form the points where made pasts of the mandap are fixed.



Tand Justing See jentacius.

The mandap is made of strong bamboo with strong hamhoo neiting spread over it. This mandap is very durable and lasts from four to five years. It is six feet high. The mandap is covered by thin and even spreading of dry grass (specially kusal grass) to obtain shade. The whole tanda is protected from wind &c. by grass tattis eight rest in height on all sides.

When all these preliminary operations are over, regular tillage operations begin. The land is dug up by a pick-axe, clods are crushed and then it is levelled by means of a shovel in the rows. Before the rains, these operations are completed. At the end of July the planting of sets is done.

Planting of the rines .- The sets of vines are generally selected from the vince of old stock. There are three to five such cuttings or sete obtained from a single vine. The sete from weak and new vines archetected. Every set is one and a half feet in length. Water is let into the field and then these sets are trampled down deep in the mud. each at a epans length on both sides of the row. Then they are ed from the soil near at hand. The space between the rows from which the soil has been used for earthing up, forme the water channel, This earthing up prevents the sets being washed away or decaying from excess of water. Every set must have nine nods or eyes (locally known as hhada) out of which five are buried in the ground and four are kept above the surface. Two leaves are kept on the exposed part of the planted set. For the first two or three days the newly planted sets are either watered by a sprinkler or by an earthen jar of egg-shape with a very small opening. After ten to fift een days the sets begin to spront. In black cotton soil the sets require twenty days to hear new leaves and roots. These must be protected from extremes of temperature; cold is warded off by spreading dry grass over them and the effect of heat is mitigated by frequent waterings. When the spronts hear two leaves and grow twelve to eighteen inches high they are tied by lavala grass or durbha grass to very thin split sticks of bamboo. which form their supports. These are fixed in the ground and tied all their further end to the mandap. They are seven to eight feet in height. There are in all eight to ten shoots of vine tied to each stick,

Generally, well irrigation is prevalent. Tank irrigation is practised but to a very small extent. In winter, regular waterings are given at an interval of four to five days and in summer on every alternate day. Manuring is generally given in the form of top dressings. The chief ronnures used are linseed cake mixture, castor cake, farm yord manure and seldore coccanut cake. The cheapest and most asful is the linseed cake mixture. The netual proportion of this mixture is,

160 lbs. finely grounded linseed cake.

5 lbs, dried coconnut pulp.

1 lb. poanded turmeric.

2 lbs. garlic. 2 lbs. ghee.

2 lb. asafætida.

1701 lbs. total.

Sixty pounds of this mixture are required for one top dressing per lamb. There are in all six such dressing given in a year each at an interval of eight to ten days so that three handred and sixty-pounds of linseed cake rotatro is required as roamure per lamb per year. No other manare is given daring the whole of the year.

The advantage derived from this mixture is, as they say, that the leaves improve in softness, fineness, colour and taste. It is supposed that farm yard manure requires a very good supply of water or otherwise the leaves get black stains. Fresh supplies of earth are also constantly required. After every two months the pan garden is earthed up with fresh earth.

Ularan or lowering of the creepers and transplanting.—When the creeper reaches the top of the mundup or a little above it, it is lowered down, the leaves are picked, and the vine is tied in the midst of the supporting stick with levala grass. This is done three or four times in a year. It is a necessary operation, otherwise the shoots might be hurat by heing exposed to the rays of the san. In January ularan begins. The whole vine is untwined, all the leaves are picked ap except some four or five leaves left at the top, which are known as tobe. The top portion of the vine about two feet long is kept above the surface of the ground tied by padyal to the supporting stick and all the rest is buried in the ground and earthed up as before. Fresh growth of the leaves is obtained just after the spring. Ularan is repeated overy year.

A landa lasts in good condition for five to six years. After this period the tanda is broken and the land has to be fallowed for four years

before it can be caltivated again. A good yield is obtained from the third year.

Picking of the leaf.—The next operation is the picking of the leafs.—The picking of a garden in full yield gives 10,000 to 32,000 leaves in one row according as the length of the row is 150 to 200 feet respectively. There are such five or six pickings obtained in a year. The leaves of different pickings are known by different names. The first and second pickings are known as Kharned and Katuur. The third picking is known as Junatean. The new leaves that spring up after utaran are known as Natatl leaves and Lambori. Out of these, Junatean not be best since they last well and bleach well.

The greatest care that should be taken in pan gardens is to keep the fields quite clern and to have regular waterings. The lands must be kept thoroughly weeded, and no decaying material is allowed to remain inside the garden or in its vicinity, in order to prevent any spread of disease.

Disease and insect posts.—The chief fungus disease which affects the plantation is known as Lokari. It arises in the summer. It turns the leaves red. This disease is supposed to be stopped when cold water is sprinkled over the leaves. This is chiefly found in pan gardens which are irrigated by tank water.

The following are the insect pests: - Ghandheli, Reta and Kapsi and the bad caterpillar.

Ghandheli.—This is an injurious insect pest affecting the crop in winter. Its eggs are white in colour. These are laid on decaying vines and weeds and they hatch there. The caterpillars eat both the vine and the leaves and the effect is that the whole creeper therins to not.

It becomes very difficult to stop the injury when the eggs are hatched. The remedy used is the application of hime as soon as eggs are seen on the creeper, and this is found to be very effective. Another treatment given is the keeping of a small bag of asafortida in the current of irrigation water.

Reta.—It appears by the curling of the leaves from the top to the bettom and thus causes injury.

Kapsı.—In summer, the vines are affected by this pest. It consists of a mass of white insects which ding to the stem, leaves and hads and slowly the creeper is eaten up. The only effective remedy is to collect the insects and hum them. Bud caterpillar.—This is a green caterpillar which cats up new shoots and buds and thus checks the growth of the creeper. No remedy is practised to prevent it When I visited the area I suggested that the affected portion be cat up and burnt. It was found that this has produced some effect in preventing its spread.

Approximate Cost of cultivation in general and the yield,—The tanda does not, as a rule, belong to one individual but it is always worked by the co-operation of fifteen to twenty members. The mala is too large for one of the local cultivations as the preliminary and other expenses of cultivation are too big to be mentred by one person. The preliminary operations are given generally by contract. These cover all the expenses of the erection of the manday, wood, dry grass for tying, mulching &c., sets for seed, digging of land, forming of the rows and causals for irrigation &c. &c.

The following are the figures for one lamb.

Maximum rate per lamb	***	•••	Rs.	100
Charges for preparing gra- fencing	***	***	Rs.	50
Charges for two permanent of per month each	oolies F	is, B	Rs.	141
Charges for manure of linseed c				16
(Rs. 11 for 300 lbs. of cake for other things.)	ennd F	is, 5		
Itrigation charges per lamb for	8 mont	hs.	Rs.	10
Other charges including cess,	marketir	g	Rs.	20
interest &c	•••	•••	$R_{s}$ .	20
Total	charges	•••	Ry.	360

One 'lac' of leaves contain approximately 16,000 similar to one huddan of leaves in Poons. At every picking nearly one lac of leaves in one lamb. For the first year there are only three pickings obtained. So the produce of leaves for the first year is 18 lacs. Average price obtained per lac is fourteen rupees, and hence the total amount obtained is Rs. 252. Therefore the less for the first year is Rs. 360 minus Rs. 252 or Rs. 105.

For the second year the preduce is more and the expenses are less. Some Rs. 20 are required for the repairing of the mandap &c., but there are no charges for the first two items in the list given above. Hence the cost of cultivation for the second year is Rs. 230. There are five pickings obtained this time. The leaves are good. The average rate obtained per lac is Rs. 15. So for thirty lacs of leaves the amount obtained is Rs. 450; deducting the expenses and the loss of the first year the actual profit remaining is Rs. 112.

From the third year onwards six good pickings can be obtained so in all thirty-six lacs of good leaves. The average rate per lac is Rs. 16 and therefore the total amount obtained is Rs. 576. Deducting the expenses Rs. 230, the net profit obtained is Rs. 346 per lamb. This profit is maintained for the third, fourth and fifth years. At the end of the fifth year the total profit obtained is Rs. 346 x 3 + Rs. 112 = Rs. 1,150 per lamb. On the whole the business of the pan garden is very costly as well as very paring.

Varieties grown.—The varieties grown, are Kapuri, Gangori, Bangala and Lawhad.

The kapuri leaf is very thin, soft and of a very good taste. When

the leaf is folded any way in the hand and let loose it regains its shape

without being torm. The size of the fully developed leaf is about six by nine inches. It is the chief variety grown. As its name signifies, it smells very faintly of campbor. It bleaches well and easily. It can be eaten in large amounts without injury.

Gangori differs from Lapuri in size and colour only. It is small in size and blackish in colour.

Bangala is another variety. The leaf is thick, greenish black and pungent. It does not bleach well. When eaten in large quantities the tongue becomes furred.

Lawhad is similar to bangala but is a little bit softer and saperior.

### A Note on Undi-oil.

B

#### N. V. Kanitkar, B. Ag.,

Demonstrator in Chemistry.

The seeds of the Undi tree (Calephyllum inophyllum). The seeds of the Undi tree (Calephyllum inophyllum). The seeds yield from fifty to sixty per cent of oil by weight. The trees are present in abundance in the Konkan in the Ratingrii district, and are there found commanly growing on the sides of the roids. The oil is extracted by the country glum and then experted to Bomhay. Some is utilised locally for burning purposes and also for varnishing boats and other things. My attention was drawn to this oil by a private gentloman who wanted to know whether the oil can be ntilised for any other industrial parison.

A sample was therefore procured and examined for its different physical and chemical constants which are given below:—

Specific Gravity	•••	•••		***	0.032
Batyro Refrictometer	Rea	ding nt	40° C	•••	69.500
Reichert-Meissl Num	ber	•••	•••	•••	2.220
Acid value	•••		•••		36.700
Equal to Oleie Acid	per ce	ent	•••	•••	18.350
Saponification value		•••	•••	•••	102-000
Insoluble fatty neids	•••	•••			93.870
Iodine value	***	***	•••	***	84.200
Lovibond's Colour-Tr	ntom	eter Re	ading	} Blu Yell	e 0.400 ow 0.000

The tintometer Reading shows that the material has a greenish appearance in thin layers. The oil has a peculiar smell which seems to be due to the volatile fatty acids present in the oil. These are present in considerable amount as is indicated by the Reichert Meiss! Number. The acid character of the oil is shown by the high percentuge of free acid. The foline value indicates that the oil belongs to the group of semi drying oils and hence its utilisation for the purpose of varnishing.

The high percentage of insoluble fatty acids would indicate the likelihood of its producing a good hard soap, and on actually preparing a soap from it a moderately hard fair lathering product was obtained.

The cal is said to have medicinal properties and hence is used as an application to the hody in certain skin diseases. If these medicinal properties of this cil are not destroyed after turning it into a scap then the scap would have valuable properties from a medical point of view. This is a matter, however, for experiment. One more advanage the scap produced from the Undeo possesses is, that it makes a toilet scap of excellent appearance without the addition of any colouring matter whatever. The green coloured oil produces a beautiful yellowish coloured scap.

This oil is sold at present at Rs. 4/8/- per manud of twenty-eight pounds, which means about six pounds per Rupes.

#### Cultivation of Cocoanut in the Pernem and Mapuca Talukas of the Portuguese Territory of Goa.

S. H. Prayag, B. Ag.

very considerable portion of the cultivated area of the territory of Goa, consists of coccanut gardens, with mangoes and jack fruit as subsidiary crops. Viewed from the hills of Panjim and surrounding villages, one sees a continuous line of cocanuts and becomes impressed with the idea that the villages near the coast, are almost buried in coccanut plantations. The has along the creeks, consists of a sandy soil, passing into red laterite soil with a large admitture of sand as we go inhand until it becomes purely laterite coil just near the foot of the hills and on the hill sides. We can thus distinguish three more or less distinct zones where coccannt cultivation is carried on viz. Pure sandy soil; Laterite mixed with sandy soil; Purely laterite soil. Besides these, coccanut cultivation follows the rivers and streams in Parcem, Siolm and other villages of the Pernem and Magnon talnkas, the palma being found on soils that are on the banks of the sweet water rivers but which also receive salt water from the sea daring high tides.

The largest part of the area under coccanuts is found either on sandy-ham seil within a distance of ten to fifteen miles from the sea, oxcluding a belt one or two miles broad along the sea or creeks, or on laterite seil with a large admixtance of sand in it. The palm thrives hest in situations that receive sweet water from the rivers and also salt water from the sea during high tides. In such situations and so obtained for a good number of years. It is less productive on sandy soils in the vicinity of the sea or of creeks and also on pure leterite soil on the hill sides,

Immediate contignity to the sea or creek does not make for the success of the palma, as the trees become wards and stunted, when the wide spreading roots come in contact with the creek water. The cultivators recognise this fact and they generally grow them in the situation mentioned above. The climate of this part of the country is hot and moist, and as a steamy climaters meet congenial to the well heing of coccannts it will be orident that Goa fulfils its climatic requirements perfectly.

Planting .- For planting, nuts that are perfectly matured, wellformed, and selected from trees of good bearing habits, are used. They are brought down from the trees by a man. The fulls from the trees are rejected, as the fall frequently cracks the inner shell, without giving any external ovidence of injury. The ants are sewn in seed beds that are ready for them, in the month of September, generally at a distance of twe to three inches apart. When the plumple has fairly thrust its way and when the sprouts are six to nine inches high, they are taken to be in the hest possible condition for permanent planting. This takes six months if the nuts are good and the seed hed too a good one; but generally it takes eight to nine months before they are ready for transplanting. In April, pits two to three cubic feet in size are dur, and in these the seedlings are transplanted, at a distance of ten to twelve feet. Wider planting is not generally practised. The planting is done either at the end of April or in the early part of May, and each plant is watered daily till the rains set in. If the soil is laterite, the following material is put in each pit, before planting the seedling:-Sand at the bettom for good and efficient drainage; over it, leaf mould, ash, sheep droppings or cowdang as may be available thoroughly mixed with original soil. Till the fourth or fifth year no more manure is given. I have been told that the regular application of manne except

a basketful of ordinary salt is scarcely followed and that excellent crops are borne for successive years. The people however recognise that if the manuring is not done for a good number of years, even in fertile soils, the trees that produced a hundred select ants a year at one time yield in succeeding years only ancertsin crops of small and inferior finits. In Parcem, fish meaning is adopted. The fish known as "Tarli'' is used at the rate of a hasket per tree, in the month of September when it is plentiful; it is put at a distance of one foot from the trnnk of the tree and is thoroughly incorporated with the soil. This manure is especially used in sandy soils. In laterite soils rich cultivators but the following manure at the end of May, or in June !—

Ash 16 lbs.
Sand 10 basketfuls.
Sheep droppings 16 to 20 lbs.

This manure is used once in three years. It is sometimes also used in sandy soils for small trees. The coconant easily responds to manure and bears luxuriantly if the manuring is proporly done. The application of salt has been said to have a beneficial effect upon the productive capacity of the tree.

Enemies.—Rats are a source of considerable loss but they are not found on an epidemic scale. Among serious insect pests, is the rinnoceros beetle which is said to appear occasionally and cause the death of many trees. The attacks are confined to the growing point and as far downwards as the wood is tender and asneepithle to the action of its powerful mandibles. Two or three grubs of these beetles, if andisturbed, are able in time to completely stop the growth of the tree and ultimately lead to its death. The beetle or its grub is searched for by drilling holes in the stems of the trees; it is taken out by a hooked wire and is killed. This remsdy is no doubt effective, but it is not possible to carry it out if the channel made by the borer is very deep, unless the hole made in the stem passes through the other end of the stem and is there examined.

Summary.—(1) Besides the meago, there seems to be no other fruit tree that may be grown to a greater extent in Gos then the cocoannt. Here a good crop of cocoaaats may be gnaranteed if the trees are planted in a snitable situation. The growing of cocoanuts is a very remunerative and most reliable industry and one that has been receiving greater attention of the people recently than in former days.

- (2) The natural enemies and diseases of the plant are relatively few and are easily held in check by the cultivators.
- (3) Wider planting than what is now followed in some parts is most desirable, as thereby exposure to the sun and air will be ensured and the trees would make a wider expanse of crown.
- (4) In view of the ever expanding demand for cocoannt products, the industry presents great attractions to palm growers and the cultivation is likely to be taken up on a scale of greater magnitude than hitberto, in the near future.

### A Reminiscence. .

RΥ

### G. S. Kurpad, B. A.

T was a bright morning. There had been a light shower the previous evening and the breeze was cool. The snn was slowly rising and I was tempted to take a walk after I bad my coffee. I went for some distance along the road which ran in front of the bungalow at which I put up, and then turned into a field on the roadside. I soon reached a small canal in which water was flowing. It lay right across my path, and not wishing to turn back. I stepped back a few paces. took a run and cleared the canal. On the other side the fields were not cultivated. It was the pasture land of the village. I collected a few stones which seemed interesting and some curious looking plants. I proceeded further and came to a small tank which was half-filled with water from the rain of the previous evening. The frogs made a deafening noise and the air was full of those winged insects which are so plentiful after a rain. Some birds were busy catching these insects and filled the air with the peculiar cry which they give on such occasions. I stayed on the bund for about five minutes and it was with great reluctance that I passed on. By this time I had lost my bearings and was only intent upon finding my way back home.

I saw a group of trees ahead and weeded my way towards it. On the other side of this grore I saw n man ploughing his land and as I saw the depth of the furrow made by the plough, I thought of the steel ploughs that I had handled when I was quite a boy. I enquired of the farmer what he thought of his land. He entertained a good opinion of it and told me that with timely rains he could keep himself and his family in ease. I then askel him if he had seen the steel plough. He said he had heard of it; but did not think much of it. 'They say that it wants two pairs of good bulls to draw that plough, air he said 'and I cannot afford to buy nud keep two pairs of hulls. especially when I can get on with these two bulls and this plough, I am an old man and have not got faith in these new ideas. These old things are good cough for me,'and he urged his team to move on. I took my dismissal silently and walked away.

I struck a path in a field close by and walked in the direction in which I thought the bungalow lay. I came poon two men lifting water from a well. 'A long beam worked on a pivot between two npright pillars. To the longer arm of this beam was attached a thin long bamboo at the lower end of which was a hacket. One man stood on two stones projecting over the edge of the well letting the hacket down and branging up the water. The other man balanced himself on the big heam near the pivot and moved this way or that, thus helping the first one as required with his weight. I had not the heart to ask them anything or suggest anything after my talk with the farmer,—and returned home.

# Some Economic Water Plants of the Bombay Presidency.

ВV

#### H. M. Chibber, H A.

INDER the title of water plants are included plants that grow in water or in the saturated soil that fringes a tank. Some of them are specially raised by men, while others grow wild. Many o them are not sufficiently known, and all of them have only a local importance so far as thus Presidence is concerned. If however better attention were pull to them some of them would no loubtedly repay the labour. The one of the greatest promise is

Traps beginned Rox5 .- Dr. T. Cooke in his "Flora of the Bombay Presidency " remarks as follows regarding this plant. Vol. I. p. 518. "In tanks throughout the Presidency, often cultivated ; very nbundant in tanks in Gnjerat. The fruit is cated by the natives, and is much exteemed. It is known to Anglo-Irdians as the water-chestant. Distribution throughout India, Cevion, Malava, Tropical Africavermicular name Shing id t." Related species are found in other parts of the world. One called Trupe nations L. grows in Kashmir, Persia and central Europe. The best variety of this species locally known as the Besmets type was introduced from Kashmir by me last year. It did well at the Vir Water works in the Poons District. One or two characters of this variety may be stated here. It takes only three months or so in this part of the country to run its course from germination to formation of fruit and seed, while the local species takes nearly double the time. In taste it is superior to the local form, but in size it is smaller. It is possible that it may not all the same be inferior in vield or productiveness. This point is yet to be settled.

Uses.—Fresh Stingads are taken by men after boiling. They are boiled with the shell. A little of iron sulphate is added to the water for boiling. The iron salt combines with tannin in the shell which thereby turns dark. The ants on cooling are on open like a gaping

<sup>&</sup>quot; Hocks: 's Flora of Pritish India Vel. II, p. 500.

oyster shell. They are sold by hawkers in this condition. The object of using iron sulphate seems to be to add to the attractiveness of the nuts, as the milk-white kernels furm a sharp contrast with the jet black shell. The nuts are also used in a dry state. They yield white flour which is used in the munufacture of sweets of all varieties. Shelled dry nuts are sold all over the Presidency by native druggists called pandhis. They are brought for sale from outside this province, as all the local product is consumed in the fresh state. After a plantation has yielded a crop of nuts the old leaves not in water. If the water of a Stingada tank is required for drinking purposes, the lenfy parts should be removed after franting is over. In parts of Europe (France) the leaves are fed to cattle in the form of sile. Skingada caltiration is also practised in China, Some particulars regarding caltivation in the Thana District of this nut are embodied in nucher article in this nutner by my friend Mr. T. R. Kotwal, B. A. Li., p. \*

Kelumbium speciosum Welld. Nymphaa Lotus L. and Nymphaa stellata Willd .- These constitute the Lotus or Kamal, with large gay flowers of different colours. They bear in fact the largest flowers to be seen in this Presidency. They all grow within tanks and form large circular shields of leaves. In the first upe the shields are elevated above the water surface when fully formed, while in the last two they remain closely applied to water. They propagate by seeds as well as by tubers. The seeds of the former are large, being the size of u groundant seed. The latter have small seeds like mustard. The embryo of the former is embedded in the interior of copions albumen which is hard as stone when dry. (The embryo forms an object of great scientific interest inasmuch as it develops green colour (chlorophyll ) while cut off from any light inside the alhumen and seed coats, which is quite unusual). The tubers of these plants are also different. In the former one, it is elongated and perforated by about a dozen straight air channels. In the latter it is compact and oval or ball like with a very thick hairy outer shell-like coat. In the former the flesh is white; in the latter it is yellow.

O The Sub-Engineer of Kheriest Canal Abmedabad Datrict informs me that thourm is from 40 to 80 kschm munds per sere (fresh state) which sells from a rupes to a rupe and a quarter per manud. In the dried state the product weighe a fourth of it, and the price then is four times as much. (Lotter No. 101 of 18th January 1912).

Uses. -The flowers may be considered first. These are useful in a number of ways. Alsthetic appreciation of their beauty and fragrance on the part of the people gives them a very high place in Hindoo mythology. They are much sought after for the same reason by Hindoo devotees. The fragrance or flavour of the netals render them neeful for the making of sherbat or sweet cooling boverages. Regarding the seeds the albamen alone in the former is edible, since the green embryo or germ is decidedly butter. The eduble part is turned into flour before it is utilised. It is regarded as highly natritions and credited with tonic properties. It enters into the composition of tonic fools poculiar to the natives of links which are known as Pals. The following analysis of water-free substance of the seeds of Nelumbium ( Kamal Kukdi ) and of Trapa ( Shing id 1) is of interest. It is taken from Bulletin No. 63 (1899) of the United States Department of Agriculture, Office of Experiment Stations, Washington, hearing the title " Some Chinese Vegetable Fool Materials ".

Wat refree substance of the world of	I'n tema	All units	Implesely Jennel	1	aten.	Cane sugar	Reducing sugar-	Crate flow	d:A.	Paleter, rangel
Nelunil inm — spieces im (Kamil kil li) Terpa lispinosa (angali)	19 23 12 15	10 95 11 (5	1 24 0 18	2 67 0-73	66 67 67 (1	4 19	2 65	3 15 2 58		8.63 1070

As regards the tubers those of the Nymphan are much sought after and reliabed. When young, they are oval and about the size of a lemon. These are known in Guyerat as Bolanda. The larger ones which represent growth of several years are called Gangad. They are either boiled or rossted. They taste somewhat like the chestnut with a peculiar and agreeable flavour.

Propagation.—Some tubers that may have been left over, spront with the beginning of the rains in Jano. The villagers often collect and preserve some seeds which form in winter, and drop these in the water that collects in the tank, hitherto dry, with the first rains. No further attention is paid to the plants.

S-irpus Kysoor Rorb.—This is me of the selges. It produces glolove tubers of a white or dark colour clothed with mutted fibres. It generally occupies the fringe af a tank. It is restricted to the Konkan.
Its local name is Kasra. The tubers which have the size of a small

potato are sweet and nourishing. The flesh is white as in the apple, and quite firm. They are to be bad about November and December. Their supply is extremely limited. It may be taken raw. If holical in a large quantity of water it looses its sngar and consequently its sweet taste. Below is given an analysis of a related plant which together with the local one is grown all over China. It is taken from the same bulletin as the previous one.

Analysis of water- free substance of the tuber of	Proteins	Albaminoids	Amides ( by	Fat.	Starch.	Cane sugar.	Reducing	Crude fibre.	Ash	Vadetermined
Eleocharis tuberous	591	4 51	137	123	36 58	27 23	11.78	£ 53	5 32	6 42

( To be continued. )

#### A Note on Agriculture in the Kotah State.

пу

#### Ghanshiam Das Gupta

FIGHE Kotah State lies in the centre of the large geological area is usually classed as the Upper Vindhyan composed of old Palacozoic rocks. Their composition is very uniform.

Although chicfly composed of sandstones, a type of rock which often contains much coarse detritus, the fineness of the rock throughout this entire formation is remarkable.

The agriculture here is very undeveloped. A simple wooden plough, a very primitive barrow and a few ather implements exhaust the list of the tools of bushandry in use in almost the whole of Rajputana. The plough used in the Kotah State may be compared with the light ploughs of Gujerat. The soil being sandy and easy to work, a pair of bullocks can do fairly good work with it. The barrow is almost similar to that in use in the Deccan with a few minor differences in construction.

Sowing is generally done by band, and it is wonderful what uniformity can be reached by this method. Fur small seeds, however, a special device is used. A funnel shaped hollow hamboo rod nearly four feet in length is taken. The mouth is covered with leather outside and in, and the whole is tied loosely to the plough, and so arranged that the seed falling from the caltivator's hands through it, drops in the furrow preprived by the plough, thus sowing one row at a time.

Intertillage operations are done with the same plough. Of course

Intertillage operations are done with the same plough. Or course it can be easily drawn through the rows, and removes shallow rooted

weeds and stirs the sarface soil to some extent.

To those who constantly hear so mach about the extended researches and notes on manning it would sound curions when I say that no mannie whatever is given to the fields. When, after a time, land refuses to yield crops, they leave it quite fallow for many years. This they can afford to do since extensive fields are always available on easy terms, owing to a sail wint of enterprising and hard working caltivators. If fallowing, infortinately, does not give sufficient tone to the debilitated land and hring it to its former condition the land is ahaadoned as harren.

The system of rotation and mixed crops is practised in a crude form, the principal crops being wheat, jouan, bajn, inferior rice, mains etc.

The most important and profitable cultivation is "opium," in the whole of the Malwa district comprising a portion of Rapintana and the Central India Agency. This industry is likely to get a death blow by the recent laws prohibiting opium in China, to which country a tremendong quantity has hitherto here annually exported.

The general condition of the ryot is very deplorable. He is quite ignorant, and deciply conservative and, I regret to say it, profoundly lary. These facts in brief show in what stage of development Rajputana is as a whole, from the agricultural stand point. However, we are sure no boly of men, even if they would, can stand still in the great race of progress going on all over the globe. We are quite bopeful of the future and believe that an ever improving condition of things is are to result from the strile towards advancement at which our countrymen are aiming. Again the history of others that have trodden the path before us, infuses courage in us to advance without fear. It fills me with hopes of ultimate success and arges us to work with full trust and belief in the Great Power, that rules all destinies. I cannot hat conclude by quoting a very common proverb in the whole of North India.

<sup>&</sup>quot; Agriculture is the hest and noblest of professions."

# Observations on the Ceylon Papaya in Poona.

L B. Kulkarni, L. Ag,

Ganeshibind Rotanical Gardens.

N May 1909, seeds of the Ceylon pripays of ropated excellence were received from the Superintendent, Botanical Gardens, Peradeniya. They were sown in pots in an ordinary way on the 3rd of Jano. The pots were kept under shade and watered daily. On the 12th, seedlings began to appear; hy the end of the month, almost all the seedlings were above the ground.

After a fortnight, the pots were gradually exposed and then after a week, the seedlings were transplanted, when they were about six to eight inches high, to the permanent field. No distinction could be made, while in pots, between the seedlings of the local types and those from the Ceylou seed. The field in which they were planted runs from east to west with a slope from south to north. The soil is medium black about three feet deep.

The seedlings were transplanted on the 22nd of July between the custord apples already in the plot, eight feet apart on all sides. No manure was given. Regalar watering was given from November at intervals of ten days. Growth on the whole was vigorous. Some special characteristics began to appear as the plants grew older—the first thung noticed being the longer internodes than are found in the local variety. The second characteristic was the thin and short petiole. The plants at the lower end of the plot where water was up to lodge, first grew vigorously and then seemed to get a check and gradually ided. Those at the upper end where water was scarce, grew slowly and flowered late. Those in the middle land good vegetative growth and flowering capacity.

Flowers appeared on the trees in the middle of the plot after ten months from sowing, while those at the upper end after fifteen months. Plants in the middle were about nine feet high when in flower, while those at the npper end were only six feet high and looked pale with leaves of a yellow colonr. Chillies of a local variety were planted between the papaya plants during the monsoon. They grew luxuriantly hat bore little fruit. In December, potatoes from the market were grown after the chillies had been removed in September. They were manured with farm-yard mannre (about two cartloads to the guntha). The enturn was about 5600 lbs. per acre (calculating as one hundred and forty pounds per guntha which was the area occupied by potato). The tubers were quite healthy.

In all, one hundred and seventy-five seedlings were transplanted; of these, nine died after transplantation. Of the remaining plants, the distribution of sexes was as follows:—

Female Hermaphrodite Male 95 29 46

Again, one hundred seedlings were transplanted, in another field, between oranges. Here the plants grow more vigorously. The leaves were dark green and the flowers appeared after nine months. The proportions of the sexes here stood thus:—

Female Hermaphrodite Male 3S 7 54 (one died).

It will be noted from the above figures that the proportion of the sexes is very different in the two cases. The only difference between the two plots, besides the defect in the level of the ground of the first already mentioned, was that the former was exposed on the north and west, while the latter was protected from the winds by the mango and other road side trees. The plants in the former were gradually destroyed line after line by the severe cold winds from the west. This fact was quite clear when the plants in the front line were found bending towards the east. Then gradually one line after another was completely destroyed.

Inflorescence.—The only differences found in this, are as follows:—
The pedancle in the male is shorter and thinner in the Ceylon papaya
than in the local variety. Female flowers also are smaller in the
Ceylon papaya than in the local variety.

Fruit.—The most common shape of the fruits is oblong-oral. The average number of fruits per plant available for the market is sixty up to the time when the plant is two years old. Each fruit weighed from one to five pounds. The average may be taken at three pounds. Again, each fruit on an average measured eight by six inches. The maximum size was twelve by ten mebes, with yellow patches here and there when approaching rineness.

The pulp varies in thickness from 1 to 11 inches and is of an oracle colour. Plenty of see is are generally found at the top. The fruits is much more pignant in taste than that of the local varieties. In taste it is luscious but not too sweet; its flavour is moderate and pleasant. It has the consistency of a well boiled potato with considerably more water.

Seeds.—These vary from a few to hundred of them in a fruit. They are smaller than those in local fruits. They are quite black when fully developed and one tola weight contains 500 to 550 when dry, and 500 to 350 when wet; while the country ones contain 400 to 450 when wet and 150 to 225 when dry.

Mr. MacMillan in his report on papins, says that fruits are generally obtained after eight to ten months from the time of sowing. The size of the fruit varies from eight to fourteen inches, while the weight runs between five and eight pounds. The taste, he says, is assully pleasant and the average number of seeds per tola when dry is 500 and when fresh, 102.

Mr. DeCruz, of Bombry in a private letter to me reports as follows about the Ceylon papaya:—He planted the seedlings ten feet apart in land meant for roses and manured with bone meal; fruits were obtained ten months after soving and they were remarkably long in size and of quite an attractive appearance and of a very sweet taste.

# Notes on Agricultural Conditions in the Bijapur District.

nΨ

#### Mr. B. S. Chenegiri.

N the following article I have put together a few notes on the conditions which prevail in the destruct to which I belong, and which has the reputation of being one of the most famine stricken in the Bombay Presidency, if not in India.

As a whole the district cannot be called hilly, though in the sonthern portion there are two ranges of small hills, chiefly running through the Budania and Bagalkot talakus. The remainder of the surface is chiefly a large rolling plateau. Forests, in the sense of large areas of tree growth, do not exist to any extent. Babut trees are focad all over the district, and there are many areas of sparsely growing trees, which are technically speaking forest, but this is all. The average annual rainfall is low, and, more than that, is extremely variable,—which may be due, in part, to the bareness of the country and the absence of forests.

The soil of the district is also very variable, but by far the larger part consists of black cotton soil in one of its many forms. In the south, however, there is a great change and there are large areas of sand or sandy loum. The black soil has the characteristics of this type,—becoming very stocky when wetted,—hungry for water and requiring much water in order to make it wet, and retaining moisture very well when once thoroughly soaked.

The climate is hot and dry. During the hot weather months—April, May and Junc,—the temperature commonly rises to 110°F. This in a district contining little chalo, and little water, makes travelling difficult at that time of the year. The difficulty of water supply is felt in every part of the district, except on the lanks of one or two of the great rivers crossing the country from List to West. As a result, the villages are far from one another, and their position is regulated, to a large extent, by the existence of wells or other means of obtaining water. It is rare in many parts to find more than one or two wells to a village,—these being public ones. It is frequent too

that this supply fails in the hot weather, and in this case, the villages have commonly to walk five or six miles for water at this season. Irrigation is, hence, not hargely used, except in a few favoured corners of the district where good wells are found. As a result, too, the condition of the cattle over much of the near is very precarious. The amount of grass available on the waste lands in the rainy season is very small,—and in many parts they are fed all through the year on dry jouar or day's folder. It is not surprising that little care is taken in the breeding of cattle.

There are four big rivers in this district, the Krishna, the Bhima, the Malprahha and the Ghriprahha, and a large salt water stream, the Don. The lands on the banks of these rivers are annually covered by the full flood in the month of August and the lands so covered are rich and fertile. The areas on the banks of the Krishna, produce first class crops notably of maize and bringals. Flat beds where water is available throughout the year are particularly selected for this cultivation. The soil on the Bhima being a sandy one, affords a good scope for Karlooy (Catrallus Vulgares) cultivation. A good variety of rabi jowar is grown here annually in the rabi season.

On the backs of the Don streum, an excellent variety of wheat is grown. The water of the streum, though now far too salt for irraption is not too saline for drubking by those who are accustomed to it, and the people are in the babit of consuming it even without boiling.

Up to the present there has been lettle introduction of crops from outside. The native cotton of short staple, is largely grown in the month of August especially in the talukas of Buapar and Bagalkot, in each of which there is a central cotton market. In other talukas, cotton is sent to the above two centres for disposal, and the profit expected by the people is very small on account of the large expense in getting the cotton to the market. On the whole, the cotton crop in this district may be looked upon as secondary. The chief cultivation is, of course, jouear, grown both in the tharif and rabi sensons. The most important tharif crops are as follows:

Jowar, bajri, tur (pigeon pea), green gram, sann (hemp), and sesamum (til).

<sup>\*</sup> See Poons Agricultural College Magazine, Vel. III, No 2.

Jowar is nearly always sowa here mixed with one of the above crops, except bajri.

The most important of the rabs crops are as fellows :-

Jowar, cotton, wheat, gram, safilower, liused, and mgorseed.
Rabi jowar is sometimes sown together with linsced or nigerseed.
Wheat is sown together with gram or antilower. Before sowing cotton, cotton seeds are dipped in water and rubbed against the bottom of a basket placed in an inverted position. This practice is generally carried on by the women.

A certain amount of rotation is practised in some parts of the district, as for instance, the sowing of rate journs one year in place of the journs or pulse in place of cotton on the same plot, but there is little systematic observance of the principle.

The chief garden crops are as follows: -

Chillies, onions, carrots, bringals, and sweet potatoes. These five crops are common to all places of the district. On the whole the garden cultivation is not good, maintres are little used and cattle maintre is ladly preserved, watering is irregular, the garden land is weedy and so on. There are some places, however where garden cultivation is well done,—some villages in the neighbourhood of Ragalkot being an example. There is only a small amount of the more difficult and intensive garden cultures like that of sugar-cane, plantains, hetel-vino, and mangoes, and the methods of carrying it out vary much in different parts of the district. The principal centres are as follows:—Betel-vino is chiefly cultivated in the Bagewadi and Endumi talukas, mangoes in Badana, sugar-cane in Siedge and Badana, in the latter to only a small extent, while plantains are grown all over where there is sufficient water.

#### College News and Notes.

FIHE long spell of holdays after the University examinations in the first pave an air of profound stillness to the College surroundings, eave for the brisk and constant stroke of the mason's hammer bustly shaping the stones, and the continued grating of the expenter's saw modelling the timber for the hostel. To the student, lowerer, this would prove little diversion, particularly if he was one who had foreseen he had no chance of being an inmate of the hostel. He is, we believe, never in this element as when he is among his fellow students; and we must horestly confess that to many of us who happened to spend the vacation or a portion of it in the station, the remion of June 4th was a matter of deep interest and eager expectation. And we dareasy the meeting was a most cordial one, for nothing binds friends faster than their getting together after a prolonged separation.

Many of our comrades—the scoiors of the last year—have left us, being ready to go and work for the good of their country. We mins them, no doubt, though it would be selfah for us to claim their companionship in the lecture-rooms for mother year. We are glad of their success that they are now graduates and are weating the toga, sclemnly conferred on them, of a profession that in India stands most in need of advancement at the hands of zealous patrons. The way before them now is truly long and a difficult now. We cannot hat wish them all smooth sailing through the occat of embarrassments that may be awaiting them. In all things, this is our sincerest wish for them that they ever prove true to the college, which has done its best to instill into them the noblest multiles of heart and intellect.

And to our new made friends, we give our warmest welcome, and desire that they may have a happy term of echolarship at the College. We hope also to see them euthousasts in all offairs pertaining the progress of the institution whose good name has kindled in ns o dear love for it and has attracted them all from far and near to it.

The students who have graduated number twenty-two and we feel pleased to give their names below. The newcomers for the regular course are forty-two. Though the majority of them consists of Hindus we are gled to see that there are several Christians and Pareses and

Mohamedans adding to the present number. The four Government scholars from Ceylon who were expected have arrived and there is another one too from Jaffina, who accompanied them to take up the agricultural course. We are proud to claim even a student from Barma who has been specially deputed for training in Agricultural Dotany and Chemistry.

The short-course class is also yearly gaining in repute, there being seventeen students on its lists

The gradual influx of students year after year speaks well for the teaching obtained at the College. The practice of agriculture and the dignity of labour, nowhere, we are of opinion, could either be learnt or appreciated better. We can hope therefore with in creasing years to see it extend more in prosperity and renown.

To turn to college descipline, we must admit that our course is largely a sort of fendal vassal to nature and as such subject to her temperaments. Last year she looked ill upon us and, much to our grief, we feel she is even more incensed this year. This her disposition very severly crosses the pith of our field work and experiments; but what is more, portends hard days for our country. The college farm is—to pat it frankly—heantifully laid out according to the final and permanent cropping scheme that his recently been drawn. But it sadily misses the greenery which might have given it and the workers at it a pleasanter look. Even now, though it is almost the middle of July and ought to hear a look of animation, it stands hare. It makes the farmer heave a sigh of pity to see the land wistfully longing for the seed to do a good turn for all the toil the labourer with the hest of implements has put on it.

The weather conditions of an approaching moason we helicere, it is most difficult for any one to say why the clouds have not and do not condense here. The outlook seems grave and we can only rely, with humble patience, on Providence to spure us from the threes of a famino which appears so ominous.

According to the new cropping scheme the major portion of the farm has been divided from cast to west into twenty-six acre plots each acre being sub-divided into four 10—gunths plots. This area is for the purpose of experiments by the B. Ag. students. The S. Ag. men have a separate area consisting of 4—gunths plots for each. The F. Ars.

have also a special piece of luct for their use in the practice of all the farm implements. This scheme greatly remedies the difficulties bither-to experienced of planing a regular system of rotation or of conducting experiments with great accuracy. The permanent paths between the various plots and their sub-divisions will now enable our visitors to make a pleasunt survey over the farm to witness the fruit of the students' own toil. We regret, however, that the B. Ag. students who had to work at kharif crops like jouzzi, cotton etc. have up to now only the few items of the operations preliminary to sowing on their cultivan sheets, and their diaries only note their expectancy of rain. The S. Ag. students had sown their cetton on the inanticipation of very good rain which the fuvourable signs at the time indicated. But theirs has probably heen a fruitless venture. At any rate every little experience on the farm is meant to be kept by—like the provident ant—for now when need comes.

There have occurred a few chroges in the college staff since the holdrigs. Mr. Buttut, Assistant Professor of Physics and Mathematics, hear returned to Sind, his place hency taken up by Mr. S. S. Goldbole, L. o. z. Mr. Butani during his stay had very much endeared himself to the students by his willing sympathy. Ho had ever a kind word for all. It is now lecturing in themstry and physics at the Sind College where we wish him the heat of success and a wide scope for his high attainments. We are sure that Mr. Goldbole will soon he equally popular with us all.

Mr. C. V. Sune, Assistant Saperintendent on the College farm has gone tack to livroid to serve in the Gakwar's State. Mr. Sane had a brilliant carcer at the College having graduated in the first class. It was through his zeal that the Agricultural Association and Debating Society got its start; and as its first secretary he worked for it with the deepest concern. As demonstrator on the farm, he was always willing to help the stadents in their difficulties. We trust that bright prospects and a carcer, as bright as his collegiate one, will stand out hefore him in the Baroda Style. We hope too that as so "old boy" he will always have an affectionate corner in his heart for the Agricultural College which has sent him forth with a prond handle to his name. Mr. B. S. Patel who topped the list of graduates in the last examination is the present Assistant Saperintender of the farm. Mr. Patel too, has been a very successful student passing

highest in all the three years of his course. He well deserves the post to which he has succeeded and we have every reason to congratulate him.

Mr. G. D. Mehta who was in charge of the Seed-Testing Department has been transferred to the Central Provinces as Supernumenry Agriculturist ander the Director of Agriculture C. P. The Seed-Testing Department has been handed over to the care of the Economic Botanist.

Mr. Chihher who was acting Loonomic Botanist during the absence on leave of Mr. Burus gave over charge on the 30th June when Mr. Burus returned We trust Mr. Burus abay profited by the change to the air of his own native highlands and we should feel glad to have from him ere long somo personal reminiscences of his picturesque country.

Mr. D. D Sanga, our Vetermary Professor, has taken a year's furlough and Mr. F. Gracias, G. B. V. C. is acting for him. He is now in chargo of the Pahlue Veterinary Hospital and also of the B. Ag. Class in Veterinary Science. Mr. B. B. Joshi, G. E. V. C. has been appointed resident officer of the hospital and he also lectures in Veterinary Science to the S. Ag. Class.

We first of all miss Mr. Sanga as he was so extremely popular. We are right glad of Mr. Gracias' deserving promotion and trust he will soon come to hold his office permanently. We welcome Mr. Joshi very confially and feel assured by his annable disposition that he will be much liked by the students.

Of the pist students, we are pleased to note the appointment of Mr. P. G. Dharwarker, B. Ag. (1911) as Agricultural Teacher in the Government High School, Kanouj. We also wish success to Mr. M. Gokulhai Desai, B. Ag. (1910) who has been sent to England by the Gaikwar's Government to get a special training in Gardening.

And we are glad to mention that Mr. V. K. Kogekar, L. Ag. (1905), recently in charge of the Dry Farming Experiments at Ahmedaagar, has been appointed organizer for the Deccan Agricultural Association since February last. We congratulate Mr. Kogekar on his new appointment and have no doubt that his past experience in the service of the Agricultural Department will stand him in good

stead in achieving distinction in the useful vocation that has opened out to him. He has been working zedously, since his appointment, in carrying improved methods of agriculture to places far removed from cities and Government Agricultural stations and his work is already being well appreciated both by cultivators and high Government officials.

The graduates in Agriculture for the year 1912, of whom twentyone received their degree in Bombay on July 2nd are:—

Mr. B. R. Bhadkamkar.

M. M. Desai.

R. K. Desai.

M. R. Godgoli

M. R. Gokarn.

V. N. Gokhale.

J. F. Gonsalves.

V. S. Habba.

K. V. Paradkar.

B. S. Patel

, V. S. Habba.
, R. V. Paradkar.
, B S. Patel
, N. V. Hanmante.
N. C Das was the only

Mr. B. B. Joshi. ,, D. K. Kale. ,, N. J. Kangle.

,, R. D. Khandeka; J. S. Kulkarni. C. R. Mugali. S. P. Nazare. A. R. Neginhal. R. G. Padhye.

,, S. K. Sane. ,, S. P. Sen. or the Diploma in Agric

Mr. N. C Das was the only candidate for the Diploma in Agriculture which he has secured by acquitting himself very creditably in the special examination held for the same at the College.

The University results in the S. Ag. Examination were very good, their being only two failures among eighteen students. Mr. S. R. Inamdur stood first. Mr. S. K. Mabableshwarkar who maked highest after the scholars holds the monitorship for the present year. The new hostel not being yet ready, the monitor has still the difficulties of his prodecessors in attending to the needs and comforts and reporting on the discipline of the different clubs, which are still dispersed.

We are sorry to record eleven failures in the F. Ag. Exmination. A higher standard required of the students taking up the course has much to account for it and we wish the students will in future succeed better by working up to the standard.

Several of our new graduates have already had the good lack of being enrolled in service, Mr. M. M. Desai under the Deputy

Director of Agriculture, Mr. Hubbu on the Alibug Farm, Mr. Hanmunte at the Poona Civil Dairy, Messrs. Gokhale and Padhye on the Manjri Farm and Mr. Neginhal on the Dharwar Farm.

We are pleased to see that the present fieldman on the Collego farm is Mr. Vandya who was the best stadent of the short course class of the year

### The College Gymkhana.

The Gymkhana which was in a state of hibernation since the course of the College was roused to life on the return of the students when ever thing that bore an air of torpid gravity gave place to cheerful guety. An tions to have as quick as ever the means of cultivating the hours of evening as a balance to the "serious consideration" of the rest of the day, the general body of the staff and students met on the 12th of Jime to elect steersmen for the easy piloting of the course of the Gymkhana.

Dr. Mann as chairman opened the proceeding with a kind welcome to all the students—the freshmen in puticular. He expressed his satisfaction at seeing every year more and more students from far and near coming to the College for instruction, and wished that they would have pleasant times there.

The annual report of the Gymkham was next read by Mr. Bhadkamkar, the retiring General Secretary, who was fortundely able to submitt in person to the meeting. He dealt at length on the work of the different departments which he said was undertaken most successfully owing to the careful attention of the various secretaries. He thanked the Gymkham Committee for its able management which to a great extent lightened the hurden of responsibility that lay on him. The report was accepted by acclamation.

Mr. Bhadkankar in giving a statement of the Gymkhana accounts showed a balance of Rs. 528-10-6 as against Rs. 236-3-3 of the previous year, a vast saving indeed of which amount it was proposed and carried that Rs. 300 should be put aside in a bank as a reserve fund.

We, on behalf of the students, feel it incumbent on us to accord n hearty vote of thanks to the Committee and mone the less to the Bhadkankar whose position as general secretary was a difficult one. We must agree that through their fine arrangements we had several most pleasant days in the field of sport, and we feel much obliged to them.

The Magazine report was also placed before the meeting and accepted. Mr. V. G. Gokhale its manager was not able to be present for the occasion though his presence would have allowed us the opportunity of telling him how succerely glad we are for his antiring and unostentations pains to improve the status of the Magazine.

Dr. Mann, before proceeding to hold the elections presented the Ahmed-Mann medals to its winners, Messrs. Bhadkamkar, Lobo, and Masani and heartily shook hands with them for the honour they had gained which he wished every individual student would covet and strive for.

The elections proved enthusiastic as usual, many names being proposed for each section of the Gymkhana. Dr. Mann was unanimously elected President and Messrs. Knight and Burns, Vice-Presidents. Mr. Ajrekar was re-elected Chairman as he proved himself during the past year unvaluable asset to the Committee in dealing promptly with difficulties and in general guiding all affairs with discornment. Mr. R. S. Insumdar was rightly chosen General Secretary. That he has parts for his charge we feel quite assured. And we hope to see him successfully attaining his object of introducing necessary improvements in the Gymkhana.

The following centlemen were duly elected secretaries for :-

Tennis. Mr. S. B. Raje. Cricket. S. R. Godbole. Football and Hockey. A X. Rehello. Gymnastics. M. R. Malihali, \*\* Agricultural Association and ? V. D. Sa. Dehating Society. G. D. Gupta. •• B. G. Patel. Reading Room.

The Secretares will best be enabled to work if the students enter fully into the spurit of the gymkbaus and by taking part in everything, learn what else is required to be done and suggest reforms. We hope then, that with the concert of the students, the secretaries will have the satisfaction of having done their duty well at the term of their office.

As it is, we already find Cricket, Tennis and Hockey highly patronised. We cannot arge too strongly the need for our men to practise more regularly so that we might put up a good team. We have this year the much desired facility of having a good ground for Cricket and Hockey. Dr. Mann who felt himself how much we were handicapped in not having a good playground did all he could to get one for us and the only way we can prove grateful to him is by uniting to turn it to best account in sports.

Hockey is holding the lead still and has bright prospects before it. We hope to give good accounts of it in the next number.

We had a very pleasant ceremony on the occasion of the opening of the new Tennis Court on the College grounds which was in course of preparation since last year. The Court is the gift of Dr. Manu to the College to immortalise the memory of his revered inother and has been named the "Mrs. Mann" Court with his consent.

This is mother great instance of Dr. Mann's loving concern for his students, and we can never be sufficiently grateful to him for his generosity

The Court was opened by Mr. Smart, the Director of Agriculture, in presence of Mrs. Smart, the staff and all the students. The opening game was played by Messes. Smart, Paranjpye, Burns and Ajrekar. We feel very thankful to all, especially the guests for having graced this very interesting occasion.

The Secretary has made very satisfactory arrangements for the members of all the dispersed clubs to have an easy chance of a game daily.

The Debating Society has n very assuring attendance this year. The opening address was delivered by Dr. Mann on "The Rah Cultivation of Rice." Dr. Mann in his opening remarks ontlined the history of the society and explained how the Magazine had its source from it. He earnestly requested the students to stand up for its advancement.

We must need say the Reading Room is excellently managed by Mr. Patel. It is far more orderly than it ever was. Of course, off and on, a picture or a magazine takes the fancy of one or the other and suddenly disappears from the table. But we trust to the good sense of the students to see that the scoretary is ever ready to oblige them if they wish to have any property of the Reading room and hope therefore that no unpleasant reports come from the secretary.

The Gymansiam has this year several experts at laths play and wrestling, and we should feel obliged if the secretary would occasionully on a holiday arrange for a display by them.

Before concluding, we cannot but express our heartfelt thanks to the retiring Magazine Committee for their honest work during the past year. That they have worked with interest for it is proved by its present popularity. Dr. Mann as usual was heart and soul in its cause. And Mr. Sabashrabaddhe helped most assiduously. We can no longer have the active services of disease. Golkhale and Patel, the late Manager and editor, for whose untiring exertions, as we have already said, we shall be ever thankful. Mr. Golkhale managed the finances extremely well leaving with the new treasurer a balance of about Rs. 100—in excess of the previous year's. We are pleased to insert their likenesses here as being two important factors in the well-being of the Magazine.

The new committee is composed as follows :-

Editors. { Mr. F. Jobo Mr. E. J. Fernando. Mr. G. B. Talvalkar. Mr. Y. N. Khale. Dr. H. H. Mann, D. St. Mr. L. N. Dhandarkar. Mr. G. S. Karpad, P. A.

We regret we have once more to crave indulgence for the late issue of the present number. But we must cardidly confess that the elections being beld on the 12th of June we found it difficult to gather material enough or to correct the proofs econ enough to be in time. Our contributors would oblige us very much indeed by submitting their articles to the cluters or to Dr. Mann at least a month before the publication of any issue and particularly that of the July and March numbers.

We need not remind any one the need of his co-operation for our success.



Mr V. N. GOKHALE, B Ag. (MAYAGLA)



Mr. B. S. PATEL B. Ag. (LDITCH)

. Manager and Uhter of last year.

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A.

Nos 54-68 (1910 to date)

Nos. 1, 2, 13-18 (1908 to date)

1. \* Department of Agriculture, South Australia, Bulletins. J. 144

\* Department of Intelligence, South Australia, Bulletins. J. 157

Adelaide, South Australia

<ol> <li>* Department of Agriculture, South Australia, Journal Vols. 1 to date (1897 to date).</li> </ol>	•••	J,	35
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<ol> <li>New York State Agricultural Society, Transactions Vols. 1 to XXXIII (1847 to 1882).</li> </ol>	•••	J.	73
2. New York State Museum (a) Entomological Bulle	tins.	J,	184
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(b) Reports of the Entomologist	•••	J.	184
Nos. 1-2, 4-13 (1682-1898)			
( After this date the reports were published as entomologic	al		
bulletins ).			
Allahabad			
1. * Department of Agriculture, United Provinces of Ag	ra		
and Oudh, Bulletins	•••	J.	12
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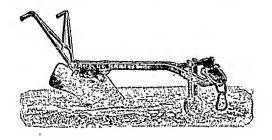
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z,	* Soils Bareau, Circulars		J. 156
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ce,	* Statistics Division, Reports, (new series) Nos. 6-7, 11 10, 22-28, 38-39, 42, 43, 47-50, 52-53,	55.	J. 170
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# POONA AGRICULTURAL COLLEGE MAGAZINE.



#### POONA.

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1912.

#### POONA AGRICULTURAL COLLEGE MAGAZINE.

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# POONA AGRICULTURAL COLLEGE MAGAZINE.



#### POONA.

PRINTED AT THE "ARTY-BECSHAR" PEESS, AND POPULSED AT POOLA

By

Gangadhar Bahvant Tahvalkar.

1912.

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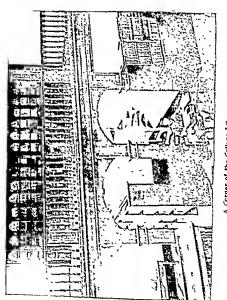
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A Corner of the College Library

# The Poona Agricultural College Magazine.

# Editorial.

AN the last number of the magnzine we called attention to the Il gloomy outlook so far as the monsoon was concerned on the Western side of India. The runs were delayed in an almost anprecedented manner, and nutil more than balf July had passed the greater part of the Doccan lay dry, with not oven enough rain to allow of the sewing of crops. Secreely had the magazine left the printers' hands when the scene changed. The rains broke over Gnurst, the Decean and the Southern Miritha Country almost at once, and came down in such quantity that in some places, especially in Guarat and at Belguam, it seemed as if the excess of rain was going to be on ovil only less than its absence. That danger has passed, and now as we Write ( August 29th ) the prospects are excellent, except in some of the Eastern districts of the Bombay Presidency-Aharedmagar, Sholapur and Buapar, in particular-where the rain has only been as yet anflicient for sowing the crops. Now we await the late rains, which usually fall in September or early October. If these are adequate, the season has every prospect of giving agricultural results above the nverage.

So far as the present number of the magnainnis concerned, we wish to direct attention to several unticlus of special interest. That by Prof. W. Burns on "The Treatment of the Roots of Fruit-Trees" claims first attention. Fruit entlare is widespread in Western India. It is the home of the best magoes. Orange orchards are common in most parts. Pluntains are, as elsowhere, almost universally cultivated where water conditions allow. Pomegranutes are regularly grown on the lighter soils. Figs, though more localised, are an important erop. Any notes which may lead to the improvement of a large industry like this will be valuable. The paper was originally read at the quarterly meeting of the Deccan Agricultural Association, and has been kindly offered for publication in this magnaine. It contains, as

will be seen, much valuable information—and information not by any means generally known.

During the quirter, a large and representative conference in connection with co-operative, and particularly with co-operative credit societies has been held in Poona. Among the papers read before that conference was one by Mr. G. K. Devdhar on "Co-operation as a Method of Famuse Insurance". As Mr. Devdhar was in the thick of operations connected with the recent folder famine in Gajarat, the paper is of great value, as coming from one who has actual first hand experience with the subject. He has been kind enough to allow us to reproduce it, and for this we one him our very best thanks.

In a former number, we printed a collection of agricultural sayings from Guant. This is followed by a cimular collection in the present number from various other venaculars by one old friend Mr. B. R. Bbd-kamkar,—whose article on the caltivation of the 'Mullai' lands on the hanks of the Krishna a year ago was very valuable. Other papers own presented deal with the peculiar hand caltivation at Bolgsam by Mr. G. L. Kottur and a continuation of the article on the cottons of Gujarat, by Mr. K. D. Kulkarai which was commenced in the last number, and on the cattle of Ranangirit by Mr. M. N. Padwekar.

We hope that with these and other material to which there is no space to call attention this number of the magazine will be found not inferior to any which have yet appeared.

# The Agricultural College Library.

ВŦ

#### Harold H. Mann.

Principal, Poona Agricultural College.

IN the last number of the Poona Agricultural College Magazine the first part of a collection of lists of the books, pamphiles, and journals in the college library was published, and it is hoped that nevery number of the Magazine for some years to come a list of the books which the library contains on some important subject will be issued. This being the case, the present seems a suitable opportunity to give a short account of the origin of the library, of its present condition, and of the purpose which it is intended to serve.

When the Agricultural College was separated finally from its association with the Poona College of Science on January 1st 1908, a few old books were handed over to it at the same time. These, together with a few Government reports and the like, constituted practically the whole library as it then existed. But it quickly grew. Many friends made valurable presentations to it, unnong the chief being Sir John Muir Mackenzie and Prof. Knight. Beyond this, the necessity of a good agricultural library is Western India so upplied to H. E. Sir G. Clarke, the Governor of Bombay that from the year 1909, a very substantial grant was made to put the library into a good condition.

This was dooe, however, on one condition. The library was not to be a college library, but was to be open to the use of the public, and to become, in fact, u central agricultural library for Western India. This fact has constantly been in mind in all later developments.

Until the new buildings were ready, the library bad most inadequate quarters, but in 1911 it was finally transferred to its ultimate
position. The room in which it is now placed, and which is shown in
one of the illustrations in the present number, is an almost ideal one
for the purpose, and it is capable of containing probably about three
times the present number of books. The ordinary books are contained
in open cases, and are completely accessible to the readers. The
journals are mostly boused in closed cases on the galleries in the
library, but are available at any time during college hours, and a
librarian is constantly present.

The library is divided into divi	sions us	follows :	
Agriculture containing		688	volumes.
Botany ( including Evulation )	containi	ng 550	37
Chemistry	,,	538	33
Zoology and Eutomology	**	238	,,
Veterinary Work and Science	>>	160	**
Geology	,,	81	,,
Glimatology	**	38	,,
Bihliography	**	10	,,
Calendars	**	41	,,
Miscellaneous	**	338	,,
Journals, Bulletins &c.	95	1856	**
Reports	19	392	**
Encyclopedias, Dictionaries, Gazetteers &c.	} "	101	**
	1	Fotal 5040	,,

The number of volumes given are those which were present on June 30th 1912 when the last accounts were made up. Since that time a considerable number have been added.

No catalogue has been published hitherto, und it is not likely than nopulete one will be used in the near future. The work of compiling one is so great that it would need a special man engaged for n least a year. But the crud index which is kept in the library is up to date, and, except for pamphlets and halletins is practically complete. The indexing of articles in poursals, however valuable this may he, is a matter for the distant future.

The library is primarily kept for the use of the students of the content of the c

I have already shown that the library at present contains 5040 books or a little over. The growth has hence been very rapid, and the following figures show this very markedly.

J	nne	1909		1182	Volumes.
,	,,	1910		2780	**
	,,	1911	•••	4660	,,
		1912		5040	

A growth like this cannot be made without the expenditure of much money,—and, apart from the numerous gifts of books to which



THE LATE R B NARAYAN VINAYAK GOLE.

I have already referred, the amount spent to the end of Jane 1912 has not been less than Rs. 19562. This does not include the cost of many of the current journals which are supplied by the Director of

Agriculture.

But such expenditure is, I think, well repaid in the present case. If we are to take advantage of the work cone and the progress made in Europe and America, in the other tropical countries of the world, and in other parts of India, then we must be able to get at it. To do this involves an up-to-date library, a living institution to which the latest literature is constantly heng added. And this is what the agricultural college library aspires to be. It has been formed for use, not for show,—and it is hoped that it will be used to the greatest extent possible. Ins is the purpose for which it exists, and if its existence helps an agricultural progress in Western India in any degree, we small feel that the expenditure of money and energy in forzing it will have been fully justified.

#### The Late Rao Bahadur Narayan Vinayak Gole.

DI.

#### S. R. Godbole.

WUMAN life is but like a gliding meteor—it glimmers for a while and is gone. Against the key hand of death it has no armour. But the actions of the just smell sweet and blossom in the dast.

Such a life passed away only a few months ago in Rao Bahadur Gole, a life which laboured with love in the cause of the sceythe and the spade. To do honour to the memory of one who interested himself so sincerely in agriculture, meseems a short sketch of his life will be equitable.

Rao Bahadur Gole was born in the village of Mardha in the Satara district in the year 1865. After his early education at Dhulia and Nasik he joined the New English School at Poona from where he matriculated in 1886. Difficulties came in the way of his higher education and he was obliged to take up an appointment in the District Court where his assidnity gained for him much of that knowledge which was of use, to him for the Pleader's examination later on. He showed his liking for agriculture by purchasing early, some garden land in the Nasik district. And though unsuccessful in his wonture, he obtained later, land at Nasik itself where he got a well dug. Later still he invested more in Iud and attempted the culture of the grape vine. It was about this time, 1903, that he had an opportunity of accompanying Sirdar Vuccharkar to Eugland where he studied minutely the Euglish farmer's hie.

On his return from England, he busied himself with the care of the grape vine and other fruit crops as measure, scantra, figs. His labours proved very fruitful and he hid out a special garden for oranges for the improvement of which he collected personally every information, oven visiting Rahari in the Nagar district. For want of sufficient irrigation first old not hive.

With the aid of Prof. Burns he experimented successfully in checking the grape vine mildew. When first he observed it, he tried Potessuam Snilphide spray and horning the plants as a remedy. But this heurg ineffective he referred the disease to Prof. Burns who by mease of Bordeaux mixture escoresifully checked the mildew. Rao Bahadur Gole then continued this treatment himself with very good results.

To turn to another feature of his enterprises, when Mr. Hadi's method of sugar manufacture was in high repute here some years back, the people of Mask collected n som of Rs. 1200, to experiment the manufacture there. But soon, interest flagged and Rao Bahadur Gole set to work at it alone, and taking the whole sugar-cane copp of a single cultivator he was able to prepare fine sugar. The comparatively inferior yield from came as compared with the foreign manufacture necessarily made this venture a failure. But he next tried the better preparation of gul by the Foon method and with the use of the Poona furnace. His success in this attempt led to the introduction of this method among the cultivators at Nasik, which was his main aim.

He was always enthusiratic in demonstrating and trying to bring in improved methods of cultivation among the cultivators. And though a pleader with his attention always in demand at the court, he employed all the leisure be could command in the pursuit of agriculture. Only a week before his death, he had brought good foreign varieties of vegetable seeds to grow them in the garden attached to his bungalow.

Apart from this helby, Rao Balandar Gole was a man who held a high place in public life. From chairman and vice-president he rose to be president of the Nasak Manicipality which position he held for years. His abilities and energetic work as head of the municipality secured for him the tutle of Rao Saheh in 1903. In 1905 he was appointed Pohlic Prosecutor at Nasak in which capacity by his heuest and careful dealings he exreed the title of Rao Bahadur. This honeur he was however not destined to enjoy loag as he received it only a day previous this is death.

Rno Bahadur Gele was related to Mr. M. S. Gele, the late Principal of the Fergasson College and a leading member of the Decean Education Society. He received his character and the spirit of doing public gool which were so markedly visible in all his actions. He died suddenly on Jane 15, 1912, leaving, by his unexpected departure, Decean agriculture power hy one noble worker for its advancement. He has, we pray, passed percofully into the realms of bliss satisfied that during his span of life, he performed his duty as a good subject to the Deity.

### Plantain Cultivation Near Poons.

BT

#### J. N. Purandare.

ANS plantain cultivation is not a very extensive industry in the metal-neighbourhood of Poona, I was tempted to go and see one of the gardens situated at Kondhanpar nboat 18 miles from Poona on the other side of the Sinlagad hills. I spent the recent vacation at the college in doing so, and the information contained in this article was collected during my visit.

The seil chosen for the plantain gurden was of a medium light nature with a perous substratum. This seil is locally called 'karai'. As high winds proval in the neighbourhood the variety chosen was 'guji' which, I was told, stands a considerable amenut of wind without injary.

The plants from a plantation in which the trees are grown for the production of leaves are not fit for use where fruit is the main object. Some types are specially cultivated for their leaves.

When a new plantation is to be commenced, the plants put out should already be about three feet high. The land is prepared in the usual way. Pits one foot deep and wide are dug eight feet apart-About four pounds of farmyard manne with some assafeetida (hing) water is put in each pit and the plantain plants are afterwards put in. Assafortida water I was told is added in order to kill any insects which may be in the mannre. The first one or two waterings are done by hand. The best season for planting is October as the plants put in June succomb to heavy runs. Watering is regularly done every six or eight days according to the season. Six months after planting, the whole field is hand dug to a denth of about eighteen inches and beds five feet square are prepared for each plant. One month after this digging the beds are again stirred and two to four baskets of manure mixed with the soil in each hed. Regular prigation is then resumed. Irrigation is pever stopped in order to give the plant a re-ting period but a digging is given just after the rains to destro; all the weeds especially 'hariali'.

Within twelve months of planting the plants flower. All the plants do not flower simultineously, some flowering a few weeks earlier or later than the myority. The plants before flowering give forth new shoots in the hed, their number varying from three to six. Some people retain all these for the following year while others retain only three. The fruits mature six months after flowering and are ready to be taken down when a vellowish time appears on them and they are well swollen. Every plant on an average gives seventy-five to eighty fruits. When the fruits are ready the stem is first cut down and then the bunch of fruits is removed. The plantation lasts for about ten years and then is usually dug ap as the beds afterwards get crowded. The plantation that I visited was one acre and twenty-eight gunthas in extent with 1000 plants vielding about Rs. 75 to Rs. 80 per month continuously for six months. The total cost of cultivation and irrigation by a well and a mhot came to about Rs. 159. The cultivator informed me that he sold the fruit at prices varying from Rs. 6 to Rs. 11 for one thousand according to the size of the fruit and nature of the market. He further informed me that he was required to go over the plantation every eight days for fruits. The seed plants which he originally obtained were hought for Rs. 6 per 100.

O In the market 116 fronts are taken as 100, and eleven times this amount are required to make one thousand A thousand plantains commercially mean therefore, 1276.

## The Treatment of the Roots of Fruit-Trees.

( A lecture delivered under the auspices of the Duccan Agricultural Association.)

FT

Prof. W. Burns, B. Sc., Economic Botamst, Bombay.

The subject of this lecture was chosen because it has been my oxperience that on this matter there is a considerable deal of misunderstanding and a need for advice.

Before going into the practical side of the question let us consider for a little the structure of the root of a tree. When we take a young plant carefully from loose soil, and wash the soil from the delicate branches of the root, we note that there is one region of each of these branches to which soil particles ching most tenseiously. This region is just behind the tip of each delicate branch of the root, and usually extends for about an meh up the rootlet. This is the region that is able to take up water from the soil, because here are developed peculiar hairs which we term root-bairs. These root-hairs are best demonstrated if we grow a seed between layers of wet blotting paper. The young roots as they protrade from the seed are seen to be covered with a white felt of lines. These hairs are the true alsorptive organs of the root. If we examine such a root-hair under the microscope, we see that it is a long thin sac lined with the living material which we call protoplasm, and contuning a clear fluid called cell sap. Water from the soil can pass through the fine cell wall and the delicate living membrane. Thus the cell sap becomes greater in volume and more dilute. A root-hair cannot hold an endeficite amount of this floid and water is continually being passed on to the inner cells of the root. As soon as this water reaches the layer of roung wood in the root it begins to ascend, for the young wood is a system of pipes specially contrived for the purpose of currying water upwards; so as soon as the water gets to this region of the young wood it begins to ascend, travels up the stem and finally out to the leaves. Some of the water is used up by the plant as it travels through these organs, and much of it is excreted through the pores of the leaves. It is important to remember that the region of the root-hairs is the only place on the root where water is absorbed. The other older and stronger parts of the root conduct water but do not alsorb it. Anything, therefore, which injures the root-hairs, juterferes with the supply of water to the plant.

This continual aptake of water from the soil results in a considerable presente being developed inside the root, forcing water up into the organs above. This root-pressure, as it is called, is one of the factors causing the ascent of water in plants. This can be clearly demonstrated by a simple experiment. A young panyara plant may be cut off near the soil and a long glass tube fitted on the cut end by means of a rubber connection. Alont five days after the experiment set agoing you can see from the movement of the water in the tube how much water has been forced up in that time. The penping force of the root varies in different trees. In the grape vine where the water has to travel a long distance it can support a column of 30 inches of mercury.

Let us now consider what are the conditions in which the roothairs can best fulfil their duties, and from these observations infer what methods of treatment of roots are rational, comparing these inferences with facts of our own and others' experience. In the first instance it is necessary to remember that the root-hairs and all the vouncer cells of the root proper are living cells and so require all that living matter stands in daily need of. Before these cells can do any work for the benefit of the rest of the plant they must themselves be healthy. One of the first requisites for living cells is a free supply of good air. The roots must breathe. In Nature there occur certain trees which have become adapted to life in ewamps where the soil is close and where water fills up all the soil interstices. These plants have special arrangements for the supply of air to their roots. If you go to the bunder at Bassein you will see in the mud flats there great areas of a plant locally called Tricar and in scientific language Aricennia alba and A officinalis. The roots of this plant send up peculiar projections above the ground. These are breathing roots. They are full of porons tissue through which the atmospheric air easily passes to the roots in the unid, just as a diver is kept in connection with the upper air hy means of the tube attached to his helmet. This fact shows the extreme importance of air to tree roots. The spil, therefore in which the roots are situated must be of such a texture that there is a sufficient interchange of the sie in the soil and atmo-pheric air. The air contained in the soil is not exactly the same as that above the soil. Within the soil oxygen (the life giving element of air ) is always being used up for processes of decomposition of organic substances, and the roots are continually taking in oxygen and giving off other gases. The air of the soil is therefore as a rule poorer in oxygen and richer in other gases than the air above the soil. What conditions then affect the permeability of the soil to atmospheric oxygen? The two most important are (1) the size and degree of cohesion of the soil particles and (2) the amount of water in the soil. With regard to the first point, if a soil is cakel and hard, although air may penetrate into the large crevices which are projuced when such soil splits, still the inside of large masses of soil is insufficiently wrate I. Small grained soil after watering tends to clog and cake like this. Larger grained soils rake less readily with regard to the second point. The condition of the uleal soil for fruit trees may be compared to that of a fine sponge which has been scaked in water and thoroughly wrong out. Every part is covered with a film of water and yet the whole mass is permented by air. Overwatering fruittrees have therefore two serious effects. In the first place, the spaces in the soil which should be occupied by air are instead filled up by water, and in the second place, the soil afterwards cakes and hardens, especially if it is at all clayer, into an impermeable mass. It is worth while noticing here that the water in the soil which the roots absorb is not that which lies freely in the soil interstices, but the film of water which remains surrounding the soil particles when the excess has drained through. The root-hairs apply themselves closely to the soil particles and absorb this film. We get here a useful hint as to the pulsoil of a fruit plantation. It is most desirable that it should be of such a kind as to allow of good drainage. Probably one of the reasons why the mango succeeds so well at Gos and Ratargiri is on account of the porosity of the laterite on which the trees grow. A marum or laterite sub-oil ensures the passing through of superfluous water. A clay bottom means that there will be danger of water logging. We have arrived at two points of practical importance. In choosing a site for a fruit garden, we must see that the soil is of such a texture that it is readily permeable to air and that the subsoil is of such a nature as to allow of the draining off of superfluous water. If the soil and sub-oil are not naturally of the desired consistency and character, still we can hyspecial treatment bring about the conditions we desire to some extent at least. The texture of the upper soil we can change by manaring and cultivation. Dry sandy soils need much bulky manure from the cowhouse or stable, and there is scarcely any soil that will not benefit from green manuring. These organic manares increase the porosity of the soil, enhance its water-holding capacity and are themselves valuable additions to the plant fool of the soil. Cultivation is essential both before and during the life of the plants. It has been again and again proved that deep and thorough ploughing and cultivation before planting the trees is an excellent investment of time, money and labour. With nucultivated

land it is well to do this first callivation as much as a year ahead of the time of planting During that period the land can be occupied with ther crops which will give some return for the out lay, keep down weeds, and maintain the loageness of the soil. On the spots where the pits are to be made however, there should be no crop during the three months previous to planting. The pits themselves and the subsoil removed from them should be exposed to air and light.

With regard to the salsoil if it is not sufficiently porous the defect must be remedied by means of drainage. If drainage is not arranged for, the effects of overwatering in such soils may be very serious indeed. In the case of orange trees, rotting of the roots sets in and the trees gradually die. Moreover the water may rise again to the surface bringing with it subsoil salts and making the land salt and unfit for fruit trees. Such a case was brought to our notice recently. Orange trees in a certain plaatatica showed a peculiar yellowing of the leaves and a gradual death of the hauches. The affected trees occurred in clumps here and there in the garden. The soil at the foot of trees in these groups was always occupied by succuleat weeks of a type associated with salty conditions. The water of the well in the garden was not salty and the previous manuring was not ench as to lead us to suspect that the disease could have been caused by it. Analysis of soil from the neighbourhood of the affected trees, showed a large proportion of salts. All the indications therefore were that the disease was due to increase in the salts of the soil due to defective drainage. Dr. Mann, who visited the plantation to advise on the matter counselled the digging of aarrow deep drains at frequent intervals throughout the diseased area with an outfall beyond the garden. This service will we hope be acted upon and we await the result next season.

Mr. D'Cruz of Bombay informs me that he was once called to a garden in Bombay where he found large white patches on the soil. The plants had a sickly look hout them and the shrubs were all stanted. The water of the well on analysis was found to contain a considerable amount of sait but not enough to do the plants harm if the drainage had hene good. By deep deging and replaciables; the soil, the conduitor of the garden was much improved. This of course was not a case of absoil salts, but of defective drainage causing on accumulation of sait from the well water. Mr. Joshi of Bassein suggests that noother way by which subsoil salt can be prevented from ascending is to spread leaves and grass on the surface of the soil round the trees in the basiu where the water is given. Evaporation from the surface of the soil is thus

considerably checked, cracking of the soil prevented, weeds also stopped and the roots protected from heat. Mr. Joshi has used this method at Bassein with excellent results for the last four years. The leaves and grass used are simply what the cooles cut when weeding. The system has been used for young mango trees, chikus, sitaphul, rubber and plantains, also coffee and cocca.

To ensure a supply of air to the roots of standing trees it is essential that the soil round the trees should be broken up occasionally to provent caking. The breiking up process is hest done 3 or 4 days after each watering. The therp or better the tikar (pick) may be used for this operation; the top layer of soil should be pulserised to act us a porous mulch, and a rake is excellent for this parpose.

Weeds growing under femit-trees have several serious effects on tho roots. The roots of the weeds occupy the ground and interfere with the upper roots of the fruit-trees Water is stolen by them which the fruit-trees can ill spare. The surface of the soil is blocked by them and the exhalation of their roots serve to poison the soil atmosphere for the treeroots. The operation of breaking up the upper layers of soil to serate the roots also removes the weeds, if properly carried out. In three separate cases of mango and orange trees in the Ganushkhind Botanical Garden and one of old orange trees in a neighbouring plantation thorough digging to 1 foot deep has been of immense advantage and stimulated rich growth in the case of the Ganeshkhind Garden oranges, combined with other treatment, has caused extraordinary fruiting. It is necessary to see that the coolies don't impre trees when digging. The consideration of weeds under fruit-trees naturally leads to the question of subcrops. The same principles must be observed here. Subcrops must not interfere with the water supply or ceration of the roots of the main crop. Closegrowing crops and long season crops are therefore out of the question. The former melude all the grasses and cereals and the latter such plants as cotton &c. Nevertheless I have seen powar grown between mange trees without apparently adversely affecting them, but these trees were large and old and stood far apart. Their roots capped deeper layers of soil than were seriously affected by the subcrop. Still the principle holds. The growing of rice between mango trees as is done in some parts of the Koukan is a practice absolutely against the health of the roots of the mango, which is not a swamp plant. While the fruit trees are young bringals, onious, chillies, and other short-season crops which are not close growing can be taken between them, but these crops must not be planted close to the trees. A circle having a diameter of

about the breadth of the crown of the tree must be left clear found the lase of each stem.

Supposing we have planted out our fruit-trees fifteen feet each way, and that the breadth of the crown of each tree is on the avorage two feet, then we should leave a circle of three feet diameter clear all round the tree, unoccupied by subcrops. The breadth of the crown of n tree in its early stages roughly corresponds to the area occupied by the roots. The next and succeeding years the dimensions of the tree will increase, and our area for subcrops will correspondingly decrease, until, when the crowns of the trees are in contact there is no space for subcrops at all, it is important that the height of the subcrop should be less than that of the fruit-trees, for if the fruit-trees are shaded by the subcrop the they grow long and lanky. When the subcrop is finally removed and the trees have to stand by themselves this long lanky stem proves to be weak and necless.

Let us now consider the life of a fruit-tree from its seedling stage to its adult condition with special reference to its root treatment.

Seeds are usually sown in pots or boxes or even in shady places in the field. Some fruit-trees such as guavas, are generally grown direct from seed and the others which are grafted or budded have their stocks grown from seed, so that we can consider the plants in their early stages as of one Lind whether grafted or not, later on. In the case of plants such as mango stocks, the early life of which is spent as a rule in pots, special care of the roots is needed. In the first place there must be n hole in the bottom of the pot to allow of the draining nway of surplus water. This hole should be covered inside by a piece of curved tile with the concar e side down to keep it open and next to it should come a layer of dry leaves to easure that fine soil is not washed down and the aperture consequently blocked. On top of this should come a mixture of medium sifted soil, sand and leaf mould, in which the seed should be planted. Daily watering is necessary. The outside of the pots should be occasionally washed and scrubbed to allow of air penetrating the earthenware, and the surface soil of the pots must be stirred at least once in three days. A small fork is best for this purpose. It must be remembered that the roots in a pot are in highly prtificial conditions and are therefore much more susceptible than are roots in the soil of fields.

For this reason, too, plants should be taken out of the pots and transplanted to the field at the earliest opportunity. Mr. D'Cruz of

Bombay writes: "The way I advise mange seedlings to be grown is to dig a trench say 9" doop and in the bottom lay a corrugated iron sheet, which should be covered with broken not herds with the concave portions inverted. Over this a layer of coir or teased matting may be spread and then a layer of sand and leaf mould covered over, in which the seeds should be inserted. After germination the roots do not go leyond the layer of corrugated sheet. The seedlings could therefore be removed carely without great injury to the pots used for grafting purposes or to their final quarters for growing as fruit-trees." If plants in pots have been neglected and it is desired to revive them, then the plant must be earefully extracted from the pot with the ball of earth adhering to the roots. This earth should be carefully removed. Dead, diseased and straggling roots should be proued off by a sharp knife. Matted roots should be separated and the main root shortened, in trees which will tolerate this treatment : mangoes do not stand shortening of the main root, orange trees do. Then the plant should be transplanted into porous gravelly soil in a small pot and kept in a warm moist shally place till recovery begins. The number of leaves on this plant should be reduced by praning off n few branches of the shoot. While the plant is recovering, water should be given very sparingly as the plant has not vet developed new root hairs to nisorh it. Root hairs closely nihern to the side of the pot and the soil and are torn off in transplanting. To get new root hairs new roots must be developed. If much water is given before the formation of new absorbing roots the roots will rot and all the labour will be in vain. When this plant begins to show signs of returning vigour it may be removed to a slightly more exposed place and thus gradually accustomed to being brought back to its normal surroundings.

It is possible to grow fruit-trees in pots during their whole life, getting produce from them in such conditions, but this is a special branch of the subject and I cannot go too it at length. Suffice it to say that the success of this branch of hortienliure depends largely on the measures taken for the health of the roots, similar to those which I have inst described.

One next question is: How should be dong fairly big, about three feet each way. The pit in the field should be dug fairly big, about three feet each way. The pit should have been dug and left open to the fair for some weeks previous to plunting, to weather the subsoil both in and out of the pit. Well exposed soil should be put in the bottom of the pit mixed with manner, but manner should in no case he placed in direct contact with the root of the tree. Previous to

putting in the tree a stake should be driven into the pit. To this the tree will be tred. To put in the stake infloring planting the tree means that some of the roots will be migred. Before planting out fruit-trees in their final places it is well to harden them to their new conditions. If this is not done the change may be so violent that the trees will not survive. This has occurred in my experience in planting out mango plants that had been long in the nursery. One must remember that in the nursery the plant has been in a more or less shady spot protected from direct sun, from wind, and from extremes of temperature. In the field it is in the open, gets the direct sun, and has all the change of temperature that is going. Moreover the root system is always slightly injured in the transplanting process, so that all the circumstances combine to make the plant lose water rapidly and replace it slowly. No wonder that infter a day the leaves begin to droop and wither and that finally the whole plant dries up and succumbs. The process of gradually acceptoming a plant to new surroundings is called hardening. One very simple method of hardening is to take the plant still in its pot out to the fields and plunge the pot in the soil near the place where it is to be transplanted. The plant should also he shaded during the first few days. The shade may then be taken off and the plant left some time longer, still in the pot. Finally the plant should be taken out of the pot and trussplanted into the pit prepared for it.

Mr. Paranjpye, Assistant Economic Botanist, who has had an extensive experience of planting budded orange and lemon trees informs me that if the plants are put out after budding with the had side facing the direction of the prevailing wind then the branches from the bud grow evenly on all sales, but if the plant be so placed that the bud is away from the wind then the plant grows lop-sided the side towards the wind Lenier staated.

Before placing the tree in position in the pit, the ball of roots should be gently easel out, and strangling and diseased roots removed. The tree should then be set on a little mound in the centre of the pit and the roots spread out over the gently sloping sides of this mound. It is a fatal error to have the base of the stem rammed down into the pit and the ends of the roots high up at the edge of it. The soil should now be thrown lightly over the roots and gently pressed down on and between them with a wooden upg. In transplanting, it is essential to mike a compute connection between root and soil, so after further addition of soil and further packing with the peg the whole surface may be tradlen over several times and earth added till the plant

is buried up to the same point as it was in the pot it previously occupied. A good soaking of water should then he gireen. The shoot should be pruned, reducing none-essential branches by about a third of their length and retaining untact such as are necessary to make a good crown. The tree may now be tied to the stake. The string should not come directly into contact with the tree but should be prided with cloth. When tying the string also, it should be brought once or twice between the tree and the stake to ensure a better and tighter binding and to keep the stake from rubbing on the tree. Tying the tree directly against the stake may result in the tree taking the form of the stake and in the case of a long irregular stake this would mean a most musightly and nesless trunk.

The stake should be removed at the earliest possible safe moment, for if the tree gets to rely on the stake it becomes weak stemmed, and heades there is ant to be compression of the trunk at the points where the tree is tied to the stake.

In trees which are intended for further transplantation such as a ninseryman's stock, it is desirable to transplant several times keeping the long roots prunel in, so that there is a great number of short hanches with many rootlets. This means that the whole inhorpitive system is in small compass and readily transportable. If the tree has to he carried some distance before heing planted, the hall of roots and earth should be tightly tied up in sacking and stead of somehow during transit. In training and pruning roots a sharp keife should always be used and the cut made in a sloping manner on the under side of the root.

There remains to be described one important series of operations which it is necessary to carry out on trees which have more than one floworing sea-on per annum. Such trees are the guar, the pomegnante, and the orange. These may flower in January at the time of the mango biossom thus giving the fruit ceason known as the Amba Bahar, or they may flower at the break of the rais an Jane when the fruit season is called the Mray Bahar; or in September when the season is called Matti Bahar. The Hatti Bahar is not usually taken because it is practically impossible to cause trees to rest during the preceding wet months, but the Amba Bahar and the Mray Bahar can be forced at will according to the season at which water is withheld from the trees. This withholding of water is usually accompanied by a partial exposure and pruning of the roots of the tree. For the the Mray Bahar at is usuall to withhold water during all April, and half of May to expose the roots from S—I weeks during that perid, according to the nature of the soil,

longer no retentive soil, shorter in pervious ceil. For Amba Bohar water is withheld half of December and all January for oranges and roots exposed as hefore. The object of these operations is to check the vegetative growth of the tree. This check in lerd formation leads to an enrichment of the resting buds, and when were is again given and the tree awakes from its rest, these buds produce flowers or dowering brunches. The question now arises which roots about he praned at the time of exposing the roots. How far also should the prote be exposed, and for how long should they be exposed? Consider what the root system of n tun var all doranger tree is hise.

The important feeding parts of the roots are the delicate tips at the end of the root hranches. We must not injure them. Hence we cannot sever the strong roots, that conduct water from these feeling roots to the trunk. We can however with safety remove these later formed roots that occur on the main branches nearer the free. It is whe to do this as we thus increase the check on the tree without materially damaging, it. It is also to be noticed that old roots heat with difficulty. Younger once heat readily.

The degree to which the roots chould be exposed is governed by the same principles. We do not wish to cause the delicate feeding roots to wither up, so we do not expose them. The first two feet of the big roots can be exposed with safety in a ten year old tree. The exposure and partial drying of these roots also acts as a check on water conduction.

On refilling the pits after a period of exposure it is customary to place manure in the pit along with the replaced earth. It is necessary to see that the manne is well mixed with the earth before replacing. Orange and other trees may not be pruned if making too rapid vegetative growth at the expense of their fruits but root pruning should be resorted only if the gentler method of expo-ure of the roots fails to have the desired effect. In severe root pruning it may be necessary to cut some of the strong roots as well as the coarse lateral roots. The cut should always be on the underside of the roat. It is usually unsafe to interfere with the tap root of hig trees. It must be most emphatically stated however that no amount of root prining will make up for a neglect of certain other commousense precantions. In many gardens which I have visited, the owners expect fruit from trees that are crowded, shaded, and kept damp by a miscellaneous collection of other trees. No root pruning will take the place of system and care in the arrangement of the plantation. Another common belief is that some artificial manure will undoubtedly cause the trees to fruit. No nrtifical manure is any use while the conditions of the garden are nahygrenic. It is as if a man

should demand medicine for a disease which is due to his refusal to wash biraself. In conclusion I have to express my thanks to Ar. A. M. D'Cruz, Horticulturist, Bombay, to Mr. G. B. Patwandhan and Mr. H. P. Paranjiye, Assistant Economic Botanists, and to Mr. P. G. Joshi, Bussein for the valuable assistance that they have given me in the preparing of this paper.

# A Note on the Bund Cultivation at Belgaum.

#### G L Kottur, B Ag

Note herry rainful tract of the Belgrum and Khanapar talink is of the Belgrum district where rice is the principal crop, the cultivators carefully level their fields and check them so as to hold the rain or irrigation water equally distributed. The size of the checks largely depends on the topography of the lund. If the land is gently eloping the checks are as big as one are but if the slope is considerable, as is often the cise, smaller checks are laid out, and consequently a large portion of the area is covered up in the embaukiments bordering the checks. In onler therefore to make good this loss a half hearted attempt is made by the rice growers to crop their builds and get some return from them. This method of bund cultivation although not very systematic is worth being a lepted with certain modifications, in other parts of the Presidency, where similar conditions exist.

#### Bund crops.

The crops that are generall, selected for growing on the bunds are i—Arbide (Hibseus canashnus), Tur (Cajanus Indicus), Meroli, a kind of sweet Wal (Dicelos Lab'ab), Vegre (a variety of jouzar), Mus, Lidd, and sometime castor.

The seeds of these are mixed according to the fancy of the owner and sown in the furrow on the top of the bunds. The seeding is generally very thick, 2 to 4 lbs. of seed being used for a bund 100 feet long. It is done as soon as the sol on the bunds is mostened by the first showers of rain about the middle of June without any previous treatment. The pluts on this account are much crowded, poor in vigent and indiscriminately muxed.

In addition to the crop on the top of the bund, ragre seedlings are also transplanted on the siles at some distance from the top. Vagre is a kind of jower having realish grain. It grows well under conditions of moderately heavy ruinfall. A sprinkling of this jower is invariably found in all the race fields round about Belgaum. In years of scanty

rainfall it is allowed to mature to grain which gives a embrantial help to the culturator when his rice crop fails. But noder ordinary conducts the power plants in the rice field are fet to cattle as soon as the rain is sufficiently heavy to interfere with their growth. Even in the young stage they are not calculated like so many journs to do any him to the cattle. This may be due to the fact of the large supply of water they get, for the culturators in the Gokak canal tract always consider that irrigated journs can be safely fet, while dry journs is dangerous and poisonous as folder when young. The transplanted seedlings withstand heavy rain, grow vigorously, and give a good outturn of grain and folder.

The tur plants are harvested in February—March. The ambadi is and about the same time and fibre extracted. The meroit pols are picked extend times in the mooths of January, February and March. The produce which varies very much in quantity is generally retained for bonn consumption. The mero't pols lowever fetch a good price there being a great demand for them in the Belguam market. But if the crop is poor as is often the case on account of improper care and cultivation of the bunds it is entirely fed to the bullocks soon after the hirrest of pride.

Every noe farmer owns on an average, eight acres of land cut up into about trenty bels or checks. Naturally he is in po-session of 30 bands each 130 feet long excluding the boundary ones which are only utilized by their common owners for heaping their weedings. If these bands are properly eard for, they can be made to yield a net profit of Rs. 20 per annum equal to one-circh of what is commonly gained from the cop occupring the ground between them.

#### Improvements.

The bands do not receive any manure although they are annually cropped. Its addatum of farm yard manure in conjunction with some quick acting fertilizer is desirable. The manure should be applied in the farrow some time before sowing. The seed aloud be dibbel at regular distances so as to save the overcowing of the plants. It is better to sow one or two crops then to mix a number of them without any definite object. Under the presents stem the different crops do not even pay the charges of larvesting and three-ling them. The laws of rotation should be object and crops changed accordingly, otherwise there is great fear in the near future of insect carmies which, from recent inquires, appear to be rapidly increasing on the bunds.

<sup>\*</sup>A confirmation of the correctness of this belief was recently obtained in this laboratory. Dry and impated jowers of the same age were examined for Hydrosyanic scid. The former contained it, the latter did not.—H. H. Mann.

# A Note on the Germination of Papaya Seeds.

#### BY

#### G. D. Mehta, L. Ag., B A, &c. and L. B Kulkarni, L. Ag.

(M) complaint was received at the Ganeshkhund Botanical Gardens,

Kirkee, in the beginning of September 1910 about the failure
of germunation of papaya seeds sent to a gentleman in Calcutta.

It was then decided to test the germination capacity of the seeds contained in the above mentioned sample at the seed testing laboratory in the Agricultural College, Poona. So a consignment of pripring seeds from the sample was sent on the 25th of September 1910 to the College laboratory. We examined these carefully. The seeds were put for germination in a glassjir filled with sterilized wet sand under the laboratory conditions (temperature-between 25°C and 30°C, on the 26th September).

For nearly a month and a half not a single seed was observed to be sprouting. All of the seeds put for germination in the jar looked quite healthy and were untitacked by any kind of mould. It might be worth while to note here that when a dead seed is put for germination in wet sind, it gets at once attacked by some kind of mould or other in a comple of days. It was assumed from the fact that no moulds oppeared that the seeds were not dead in any case, but that some external cause was hindering the germination. On the 10th of November 1910 two seeds were noticed to have spronted and later on in December, some few more were found to have germinated.

This sort of result led us to resolve upon undertaking a regular interstitation of the period of vitality and the germination capacity of peapers useds. The unegal withy of the germination of the seeds from the first sample led us to believe that perhaps the thick tests of the seed might be hindering the penetration of moisture to the embryo within the seed just as is often found to be the case with some so called "hard" leguminous seeds.

A fresh scheme of experiments was soon prepared and a regular investigation of the germination capacity and the period of vitality was undertaken. The first sample of the new series from the Ganesh-khind Gardens was received at the laboratory on the 31st of January 1911. The seeds from this sample were put for germination in a specially prepared and sterilized flower pot. Since then fresh samples

have been regularly received at intervals of eight to ten days and put down regularly for germination. But the results obtained till the first of March were very discouraging. Not a single seed was found to be spronting.

Owing to want of space this experiment was then discontinued in the laboratory and it has been carried on since that time in the Gueshbind Retained fortless.

The results of the seels sown from March 1911 and also those sown before March . e. sown in September, November and December 1910 are tabulated below. All the seeds (except where it is mentioned that they were fresh) were collected in 1910—from January to Mar.

These experiments have been thus regularly made from March 1911 to the end of March 1912. From the table the following conclusions can be temporarily drawn:—

(1) The germination capacity varies according to the season of the year.

From March to the end of May (summer) the percentage of germination varies from 8 to 25: average may be taken as 12 and the period of germination is 36 days gradually decreasing to 9 days.

During the monsoon (June to the end of Angust) the percentage vanes from 52 to 88, the average being 69. Percod-11 to 23 days except in the case of Cepton, a foreign vanety, which took 42 days.

From September to the end of October the percentage is very low namely 4 to 12; period is from 15 days to some months in many cases.

In November when there were slight showers the percentage again increased, say from 12 to 40-period 1 to 23 days.

From December to March ngain the percentage of germination varies from 4 to 20 except in one or two cases, and period increased from 20 days to months even till June.

This shows that the best and safest season is the beginning of the monsoon.

- (2) Seeds retain their vitality for a long period in the soil. Thus is clear from the instances. 50 per cent seeds sown in Angust 1911 rerminated in June 1912.
  - (3) Fresh sown seeds germinate a little earlier than dry seeds.

The seeds used above were not from une tree. They are a mixture. As this experiment is being continued ugain this year we hope that more complete results will be obtained next year.

Variety.	No. of seeds sown		to c		ger	to c min ion.	a-	No. of seed- lings.	Period (ap- proximately).	Remarks.
Conntry	23	29	9	10	22 12	10 11	10	2 3}	8 months	
Ceylon	25	4	11	10	24	6	11	į (	in all. 140 days.	
Country	٠,,	18	12	10	10	4	11	5	113 ,	1
,,	, ,,	5	3	11	10	4	11	3	36 .,	ļ
"	1 7	111	3	iı	12	4	11	4	22 ,,	ì
"	"	17	3	11	6	4	11	6	20 ,	Fresh seeds
"	, ,,	22	3	11	13	4	11	4	22 ,,	? dried of the
"	",	3	4	11	22	4	11	e	19 ,,	dried of the
ű,	,,	118	4	11	3	5	11	6	15 ,,	1-
"	,,	20	4	11	5	5	11	2	15 ,,	l .
"	,,	26	4	11	5	5	11	4	9 ,,	Fresh seeds dried of the
",	"	29	4	11	13	5	11	6	14 ,,	dried of the
,,	,,	29	5	11	12	€	11	13	14 )	same fruit.
		1			15	6	11	4	17 } ,	
"	"	1	€	11	13	€	11	14	12 7 ,,	) )
	1				16	6	11	3	15 ζ,,	( Fresh dry of
,,	, ,,	ે 3	6	11	16	6	11	12	13 [ ,,	the same frui
,		1			18	€	11	4	15 },,	1)
,,	,,	5	6	11	19	€	11	161	14 ,,	1
					22	€	11		17 ,,	1
,,	"	10	- 6	1	21	6	11		117,	1
					20		11		125,,	
**	,,	12			21	G			12 ,,	1
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# A Note on Co-operation as Measure of Famine Insurance.

BY

G. K. Devdhar, M. A., Servants of India Society.

OW that the famine in Gujarath and Kathiawar is fortunately tended and has become a matter of past history, ite lessone are occupying the minds of some thoughtful and carnest men who have the interests of Indian agriculturists at beart. The recent famine was munly a fodder famine; and one of its valuable lessons is the condition of preparedness to promptly deal with the situation created by the total fulure of crops and the consequent acarcity of fod ier supply. This question of readiness to fight out such a famine by effording assistance to agriculturists in the chape of foller or money to purchase it, from the moment the signs of an approaching famine become imminent, centres round the eternal problem of innis to be utilized for the purpose of either storing large quantities of hay read, for immediate use or for the purpose of helping the agriculturists with money grants to meet their various wants during the period of stress. To achieve this end two or three schemes have been projected. Broadly speaking, they are based upon the principle of eccuring some sort of famine insurance. Without, however, entering into any examination of the merits of these recommendations, let us ask ourselves the question whether we cooperators have any scheme to propose, calculated to promote the same object; and this note is written with a view to attempt an answer to this question from the stand-point of a co-operator.

Any scheme which has for its immediate object the granting of facilities which the agriculturists as a class so bully need, particularly in India, to tide over the out effects of a famine must be based upon a foundation that will develop self-reliance, sense of responsibility thrift, and foreight on the part of the agriculturists and that will organize their credit. Without these the superstructure exceed by presented and abpling in its results. The history of agriculture in all countries where it has prospered under modern conditions bully points out to the fact that co-operation has very largely supplied these needs; and, while giving the agriculturists a comparative immunity from the evil effects of famine, it not from famine itself, it is co-operation alone which has put the agricultural industry on a sound economic basis.

There is no industry which is so much exposed to the freaks and frowns of seasons as the industry of agriculture and this great element of uncertainty enters so largely into the prospects of agriculture that its position in a country like India is rendered very precarious owing to this and several other canes. A famine is far-reaching in its effects. It affects most of the industries in a country, in a smaller or greater degree ; but the one that suffers most at its hands is agriculture which forms the bed-rock of numerous industries and many industrial and commercial activities. Though the ravages of famile paralyse for a time undustrial fabric of a country, it is agriculture that receives the hardest blow on account ni its re-ources which are already very meagre being exhausted and because of the creat of the agriculturists having anuk very low. It thus takes agriculture very long to recoup its lost strength and smallty. If, therefore, these dangers are to be averted and agriculturists are to be re-ened from this element of uncertainty of prospects, we must think of measures of in-uring agriculture against famine and the most effective measure of famine insurance in the interests of agriculture is, in my apinion, the organization of Co-operative Credit Societies.

It is possible that at one time or another some portion of this vast Indian continent may find atself in the grip of famine or scarcity of food. But with the advancing tide of modern industrialism it is refreshing to note that the rigour of famine at the present time is considerably mitigated. Moreover, the duly increasing means of transport of fodder and grain to feel the cattle and ham in beings in the famine. stricken area-, have removed many difficulties in the path of the poor agriculturists whose sole need naw is the sapply of cheap money for the purchase of grain and fodder, which, as a rule, are available "at a price no longer affected by local scarcity but regulated by the market price of the food in the great distributing centres plus the cost of conveyance to the place where the scarcity exists." It is one of the functions of co-operation to enable the agriculturist to secure chean money by erganizing his credit. Mr. H. Dupernex, I. C. S., in his admirable book 'People's Bank for Northern India" treats of the relation which Co-operative Credit bears to famine. In this connection he observes as follow .-

Now that India possesses every facility of transport and conveyance for moving her food stocks from place to place wherever exactity exists, famine may be said to have entered on a new phase. The organization of transport is complete, the next step is the organization of credit, The more a country engages in commerce, the more ite wealth acenmulates, the better able it is to withstand the shocks of famine. Industrial development is intimately connected with a properly organised system of credit. If it is conceded that famine is to a great extent the result of the dependence of the great mass of the population on agriculture alone, that some of the worst evils of famine may be removed by the establishment of other industries, then the first requisite for attaining the latter desimble object is by fostering the widespread institution of ponular backs."

The Indian Famine Commission's Report of 1991 discusses both the curative and protective or preventive measures of famine relief. The third or the last part of this valuable document is devoted to the consideration of protective remedies in the scheme of which a distinct place is assigned to the formation of agricultural banks. The Commissioners say :—

- "We attach the highest importance to the establishment of some organization or method whereby cultivarous may obtain, without paying nannous rates of interest, and without being given under facilities for incurring dobt, the advances necessary for carrying on their business. Agriculture, like other industries, is supported on credit." The whole of the Section 4th of this Part is devoted to the definition, principles, objects, and the working of these agricultural banks or what we now call Co-operative Credit Societies. In dealing with the comparative ments of State Aid. the Commissioners observe as follows:
- "But even the fuller measure of State Aid in the chape of takeri loans, which we shall recommend, will go but a small way towards removing the difficulties of the whole class. Government cannot possibly finance all the cultivators of a district, still less of a province. In the establishment of Mutaal Credit Associations lies a large hope for the future of agriculture in Iodus; and from the enquiries we have made there is reason to believe that, if taken up and pressed with patience and energy, such associations may be successfully worked." After dwelling at some length on the details of their working, the Report of the Famine Commission goes on to say:—
- "The above is only a brief sketch of the principles, organization and object of village brinks founded on the Raiffeisen system. It appears to us that there is in every province, which we have visited, a welle scope for the establishment of such lanks? some have been already established in the North-Weetern Provinces and Ondh. In

some provinces the bope of successful working is better than in others, but everywhere there is justification for an effort. No doubt such banks may, in the commencement, meet with opposition from the money-lender who already occupies the field, and they may also meet with suspicion and balf-hearted support from those who do not understand their principles. But Inlian nature life presents us with instances of co-operation for mutual benefit, and the principle which underlies the Ruiffeisen system is not really forcign to the thoughts of the people."

It will be clear from the foregoing paragraphs that eminent advocates of co-operation have shown the potency and efficient of co-operation as a measure of famine insurance. Mr. Dupernex has dealt with the subject at great length and Sir Frederick Nicholson, whose name is very familiar to Indian co-operators by the "Monumental" volumes which embody the results of a most punstaking unquiry and study of the theory and practice of co-operative credit in Europe conducted by him, served on the Famine Commission of 1901 and has fully explained how co-operation prepares cultivators to cope with the famine. Wolff, who is the greatest existing anthonity on co-operation, while discussing the argent need of teaching the "debt-hardened" mysts how "certainly to India Co-operative Credit promises to prove a boon" remarks that "in rural districts its need is great rising from time to time to the point of famire." Thus the testimony of these three great anthonities in co-operative matters is sample in mypinion to convince us of the power and n-effilness of linking co-operation to agriculture so us to gradually free the latter by means of the former from the havoes which a year of famine works upon the agriculture of the land.

Granting, therefore, that the organization of co-operative credit is an effective remedy to achieve the object we co-operators have in view, the next question is: Which is the best time to commence that work? Considering the state of ignorance in which we find the vast majority of our masses at the present moment, and considering also their condition of inter dependence upon the village bunnish, the work is bound to be very slow. The popular adage that "Rome was not built in a single day" will laterally prove true in this case. The present, however, is the best time to give our thought to this subject, particularly when the famine-striken people have emerged out of their troubles with the lessons of famine quite fresh in their minds. Mr. Dupennex has to make the following recommendation in this connection. He says:—

"But system of credit is not to be created in a day; it requires several years' work to organize on a fitting scale and, if reliance is to be placed on an organized system of credit as a means of combating famine in the fature, it should be taken in hand during the seasons of comparative plenty that usually intervene between two famines." Microover, there is no reason to despar. Mr. Wolff, who is so very searching in his examination of the methods and results of co-operation, speaks in very appreciate terms of the achievements of the first four years' working of these societies in this country (when there were only 2008 societies existing) and expresses not only satisfaction, but even surprise at this great p ogress made by the co-operative movement in India. He says "That is a record which has no where yet been equalled within the very first stage. The elasticity shown by the co-operative credit presents a striking contrast to the stagendors amount of work that the shefore the Indian co-operators we have no reason to feel orenoved.

At this stage it may be asked that the theory sounds well but has it unswered well in practice? To this I reply in the affirmative by taking my stand on the re-ults actually secured both in Western countries and as also in India. Co-operation has proved a veritable blessing both during the period prior to the famine and so also during the period of funine in two different directions. It has increased the staying power of the agricultura-ts who are the first to fall victims to the evils of famine; and secondly it has enhanced their credit by popularising it. The Report of the proceedings of the English Congress of the International Co-perative Alliance held in 1910 states that by the end of 190" there were over 91,033 ('o-operative Societies in 15 lending countries of Europe. Of these 20 per cent were distributive Societies and nearly 60 per cent must be those that benefitted the agricultural classes, in a variety of ways. The figures relating to Germany alone, will be found very interesting. Ont of a total of 26.852 Co-operative Societies in Germany in 1905 consisting of a membership of 4,105,602 there are 20, 10 Co-operative Societies serving the rural population and bearing the proportion of 75 per cent to the total number. Of these latter 16,092 are Credit Societies with a membership of 22,02,049. Mr. Wolff says that "In Germany alone, mayos, on lanks of the Schulte-Dehtzsch type only dealt out in advances of various kinds the large sum of £175,000,000 which has in this way been made to fractify in commerce, industry and agriculture, purchasing raw material and maying wares. The sum lent

ont in the same year by about 17,900 Co-operative banks registered in Germany reached altogether the huge figure of nearly £240,000,000," which in Indian coin means 360 crores of rupees.

Considering the growth of agricultural co-operation in other countries, it can be easily seen what a gigantic stream of wealth is made to flow into the channel of agricultural development. If one wants to know what the condition of the agriculturests without this side of co-operation had been in these countries, let the pages of German and Italian history dealing with the condition of the peasants in these countries in the early fifties and sixties of the last century be perused and a moment's reflection will cousince the reader that cooperation has not only been their salvation but it has proved a real resurrection. As regards India we have the following interesting rearrection. As regards man we have one notioning interesting figures. During the year 1010-11, we had in all 5,432 societies showing an increase of 270 per cent over those of 1005 consisting of 3,14,101 members and with a working capital of Rs. 20,676,903. We in Bombay, however, are very hickward having to-day only 368 societies consisting of 29,413 members and with a working capital of Rs. 32,05,011. The rural societies in India number 4,957 with n membership of 2,35,978 and these have a working capital of Rs. 11,018,803. All this money courses into the veins of agricultural occupations followed by the members of these societies and supplies their immediate wants by grant of money at much cheaper rates. To that extent their staying power is improved and their credit has been augmented. Thus, to some extent the position of Indian agriculture angements. It is the state of the needs of our vast cultivating population, though, this is very small relief. Still it is a matter for some satisfaction that a sound beginning has been made in that direction.

So far an attempt is made at showing how co-operative credit can when as a preventive or protective measure of famine insurance. Coming more closely, however, to the time when the cultivators find themselves actually in the midst of a famine it is not difficult to point ont how co-operation has stool them in good stead. Mr. Dupernex observes that "the nuitily of an organized system of popular credit in time of famine is one that has been abundantly demonstrated by the working of the Raiffeisen bunks in Germany during a year of carrety and by that of the popular banks in Italy during times of depression and distress." Here in India, we too have a few telling

instances to prove how members of co-operative credit societies have been enabled by means of their systematised and organized credit to procure cheip money for meeting the needs created by the recent famine or scarcity. Mr. R. B. Ewbank, our present Registar, drew my attention pointedly to the societies of the Gadag Taluka in the District of Dharwar. This Talaka suffered severely from the famine of folder as did several other districts in Gnjarath and in the Deccan. Unt of the 33 rural societies in the Dharwar District, 21 Gadag societies have raised altogether Rs. 30,390i- from members, Rs. 22,933/from non-members, and Rs. 15,000/- from other societies up to March 31, 1912. Rendes these loans 13 of these societies were granted a total loan of Rs 59.500 by the Bombay Central Co-operative Society. This brings the total of their leans of Rs. 1,17,823/-. Now I ask would these agricultarists have, during the time of the famine when their credit in the market is very feeble, got such a large and cheap supply of money in such a self-respecting and self-reliant manner if they had not come together and grouned themselves as co-operators? I for one do not think so. Again, in Gujamth some of the ruml societies in the three famine-affected districts of Ahmedabad, Kuira, and the Panchmahals on the strength of their co-operative character could get some as-istance from the charitable Famine Relief Agencies like the Central Famine Relief Committee and the Wadia Charities in Bombay. Besides the Bombay Central Co-operative Bank granted them longs at 7 per cent for the purchase of hay for their members. The Wadia Charities in recognition of their co-operative basis cold nearly to half a dozen societies grass worth about Rs. 1,000/- at Rs. 8/- per 1,000 lbs, and made a free gmnt of Rs. 1,200/- to enable small societies, with a portion of this grant as a nucleons to baild ap a famine fund, and the Central Famine Relief Fund paid them a sum of Rs. 1,000/- to enable them to purchase grass for their members at cheaper rates. Two things stand out boldly. First the principal of self-reliance is gaining a stronger hold on these societies, and secondly, their credit with ontside financing agencies is assuredly growing.

A stage has now been reached in the development of Indian cooperation, when agriculturists can be asked to concert measures of durect utility by providing a separate famine fund with their societies as a means of insuring their agricultare against famine. If cooperation is to be true it must teach its votaries the lesson of foresight. In Barma, Cattle Insurance Societies have been a success and there is no reason, therefore, why famine meanrance funds to be built by societies or quions of societies should not he successfully started. If each society, instead of keeping a store of hay in readiness from year to year, makes it a conlition that every member will contribute one rupee to form a separate famine fund and if to this fund the society will add 1/10 of its annual profits and invests the same at 5 per cent with the Central Bank to be utilized only during the time of famine. a sufficient amount will be easily available for famine purposes in this way An average society with a membership of 50 and making an annual profit of Rs. 200 will easily have, by this method, in the course of ten years, which is generally considered to be the intervening period between two famines, a sam of Rs. 759/- as a result of cooperation coupled with thrift. Again this readiness and foresight on the part of the members of these societies will enable them to procure sufficient and cheap loans without depending upon the sweet mercies of the village sawcar with whom their individual credit is generally This, in my opinion, is the real solution of the question of famine in arance to favour of agriculture, and co-operation alone will nfford the agriculturest the help and the relief which they so sailly need both before and during the period of famine. "To sum np," in the word of Mr. Dapernox, "the relations of credit to famine, we claim first, that with an organized system of credit, the village co-sharer, the better class callitator, the struggling clerk would nil be better able to stand the strain if familiarity with credit institutions had previously taught them the lesson of thrift, and if, when the real pinch came, the doors of such an institution were ready to upen for them and provide means for enabling them to tide over the worst till the ndvent of better days."

### A Short Note on Cattle in the Ratnagiri District.

BY

#### M. N. Padwekar, B. Ag.

THE breed of cattle kept in the Ratnegiri District has many peculiar characters. In general appearance it resembles the freed most commonly employed over the Konkan (Konkani) but it is also known as Buratt (Khati) partly owing to the email size of the animals. The bullocks and bull-buffaloes are, as elsewhere, used for ploughs and carts, whole the cows and ehe-buffaloes supply what little milk the people want.

It is difficult to describe the peculiarities of this breed, the small eight and the activity of the animals being the features which are usually most noticed by a casual observer. The colour varies, but white is rarely found. The animals are about three feet high and six feet long. They are docile and can be easily broken in to use. The prices vary very much but on an average they are:—

Bullocks .			• • •	from	Rs.	20/-	to	Rs.	60/-
Cows .			•••	**	R5.	10/-	to	Rs.	30/-
Ball-buffalor	:5 .	٠.	•••	,,	Rs.	20/-	to	Rs.	40/-
Buffaloes .			•••	**	Rs.	30/-	to	Rs.	70/-

The variation of price is mostly due to the form, structure and build of the animal, but depends also now its doculty. In the case of cows and she buffalces, mulk yield is taken largely into consideration at the ' time of purchase.

The supply of the animals is limited owing to some extent to the want of folder and good grazing fields. Some of the poorer cultivators sell the animals to maintain themselves in the hot season and buy them in the mousoon when they borrow money from the money lenders. The animals hought under such circumstances are, of course, usually inferior and can do vary little agricultural work. Bull-infilious are not generally bought by the cultivators except by dealers in cattle who are known on this side as \*Heddari (?wwf). They hay the buffaloes for a very email earn and sell them in the higher tands side. The bull-buffaloes though useful in dragging heavy loads require very liberal feeding, which an ordinary cultivator cannot afford to eupply. Another nest they are put to is at the time of transplanting nec seedlings. There is likelihood, however, that in the near future their ase will be much increased as hetter cultivation than has higherted been that rule is adopted. Another reason

for the neglect of buffaloes is that they work clowly. The implements at present in use are light and hence a good deal of time and energy are wasted if buffaloes he yoked-

People as a general rule da not import cattle of a better quality as the climate does not snit them. Besides they do not get their astaml fodder. Even in this narrow tmet faar kinds of variation can be marked.

- (a) Cattle aurtured an fodder grown on sandy soil.
- (h) Cattle nartured on folder grown on laterite soil.
- (c) Cattle unringed on fod ler grown on black soil (Trap).
- (d) Cattle bred in hilly tracts.

The variation is due to the value of the fielder. The folder grown on black soil is far sapotior to that on the early soil. The cattle bred in the hilly parts of the district are particularly hardy.

There are no epocial means of breeding cattle. When the cowe or buffuloes let out for grazing come in heat they are served by some wandering male of its class and beaco the off-spring tonds to be inferior. In some places only bulls and bull-buffaloes are kept for breeding purposes and they are allowed to serve any female cattle for a trifling fee which does not ordinarily exceed a rapce. The question of cost is the only matter taken into consideration in nourishing such sires. The expenses of keeping a breeding ball in good condition will appear to be rogsiderable, but I cannot help thinking that the result of doing so will more than compensate for the trouble involved. Another point deserving notice in this connection is the marsing and feeding of the calves. Generally calves are not allowed to each enflicient milk at the teats of the mother, and hence as they get no other food, the mortality among them is very great. The adequate feeding ar narsing of calves is almost entirely aeglected. Further, as the male calves grow up, little regulation of breeding from them takes place, and they are not usually castrated until nearly full grown.

There are grazing grounds attached to come villages but the area is not savally sufficient for the village cattle. In villages where such grounds are not available the people send the cattle for grazing in their awn fields if possible or in their neighbour's fields on payment of certain fees. The folder grasses available in the Kbed taluka (in which I write) consist of:—

Murga grass, Durwa, Matari Undya, Kaswin Bhatyan, Gonderi Bhatyan i. e., Payan Tikali, Mirkat, Putni, Bardi, Argadi, Pati &c. They are also fed with Nagli grain and rice straw and baulms of pulses if possible. Most of the grasses mentioned above are considered to lave little untritive value. The supply of better and more untritive tolder grasses is an urgent need. Silage can be made with much profit as there is a great scarcity of error folder in the dry easeou.

In towns it is not possible for any hat the wealthy to keep cattle for milking purposes. Whatever milk they wan is supplied to them by the inhibitants of villages round about. The milk is usually leavily ad illerated with water, but, in spate of this, it is sold at the rate of five to ten seers per rupee, each seer weighing 80 tolas. The milk producer's evpenses amount to from four to eight nams are head of cattle.

When the milk given by cows begins to decline, the poor men who cannot convenently maintain them sell them with the caives at reduced prices which are assally about half of what they would otherwise have fetched. There ere a class of dealers who make a speciality of huping an hoovs. They mailtain the cattle till they calve, when they are soll so that they get a profit of about thirty per cent at least, excluding the elder caives, which may be recknowed as profit in addition. They also purchase young caives or weak cattle to which they give pumper feed and later on sell et much higher prices. On an average the dealers get more thin 20% profit.

The essentials of a gool cattle farm are extensive grating grounds, goal water end fool supply. The farm must also be at a convenient distance from some big town for procuring the necessary supply. It is very milkely that such a place can be found in Ratingfir. In fact, I do not think that this district can ever become a great cattle country. The absence of good grazing grounds in this tract has long been felt. This is partly due to Khoti tenure in this district, and consequently in the absence of the provision of public grazing, it seems that even such failitties as in other directions the district possesses cannot be fully rultised.

## Sayings and Proverbs on Agriculture Translated from Various Vernaculars.

EY

## B. R. Ebedkemker, B Ag

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THE following sayings and proverbs show the overpowering dethe pendence of agriculture on the rainfall and the popular heliefs as to what various natural phenomena foretell in respect to the rainfall and other features of the weather.

- 1. If clouds with their wealth of waters fail to pour on earth, the plougher's plough and the exen's sturdy team will be no more.
- 2. Even Mahadeva (the God Shiva) does not know when it will rain or when child-high will take place.
  - 3. If the sky ful, the earth will ful and charity too.
- 4. The crop that is not rained on and the child that does not see its mother's face will not live.
  - 5. Heavy rain is not attended with cold.
  - 6. Rain thrice a month is desirable.
  - 7. A continuous drizzle is preferable to heavy mins at intervals.
  - 8. A drizzling rain brings attack of conductive insect perts.
  - 9. A large halo round the sun foretells rain during the day time and also forebodes famine.
- 10. If a rainbow appears in the east in the evening or in the west in the morning, it will rain.
- 11. A red sky in the morning (even in the rainy season) fore-tells failure of rain.
  - 12. If the morning sky be red, it will rain in the ocean.
  - 13. Red clouds at sunset foretell early rain.
- 14. The morning cloud, the gathering together of asses, and a sonthernly breeze in the evening are signs of no rain.
- 15. If the clouds disperse ( in the rainy season ) lend your stored seeds at interest.
- 16. Thunder in the morning, a hot sun at noon, and clouds in the evening are fore-runners of rain.
  - 17. Instant rain follows wind belonging from all sides,

Strong wind foretells rain, as excessive familiarity hegets enmity. 19. If the south wind blows in the rainy season, sell your bullocks

and purchase sheep.

The following few sayings and proverbs indicate the relation hetween insect pests and rain.

A large swarm of white butterflies foretells heavy floods. 20.

Rain ceases when winced white auts uppear. 21.

22. Excessive rain follows, if white ants take wing in the evening.

23. If ants move to high ground with their eggs rain will follow.

24. If the dragon-fly flies low, it will rain without tail.

25. If mosquitoes be active in the evening, there will be rain.

26. If from creak rain will follow.

27. If the crab crawls, the country will flearish.

The following sayings show fore-casts based upon the occurrence of lightning and thunder.

28. The more the lightning, the heavier the rain.

A harking dog seldom hites, and a thundering sky seldom rains.

30. Thunder in the hot weather and lightning during the rainy season bring heavy rain.

31. If there he thunder in the rainy season and lightning in the hot weather, there will be no rais. 32. If it rains on a Saturday evening, crops will be free from

disease and be fruitful. The following sayings and proverbs show the necessity and the

importance of tillage, manuring, irrigation, and weeding in egriculture.

## Tillage.

1. A girl not leved by her husband and a crop on unplonghed land are useless.

2. If the soil he ploughed to the consistency of butter, the yield will be a mountain heap.

3. Better plough six times m a hundred days than a hundred times in six days.

4. Plonghing can do what manuring caunot.

5. Defective ploughing cannot be made up by manuring.

- 6. Sow thick and plough deep.
- 7. Plough for depth instead of hreadth.
- 8. He will be tired of ploughing who depends upon the dewfall.
- 9. If soil be allowed to dry after ploughing, the yield of grain will be doubled.
  - 10. Plough with a pointed edge and level with the broad face.
- 11. Regulate the size of the plough by the streagth of your arm and that of the stilts by the length of your legs.
  - 12. Do not plough so as to cut the grass.
- 13. Wet land ploughed seven times and seed dried seven times can withstand drought for seventy days.

#### Manuring

- 14. A field without manure is like a cow without calf.
- 15. Worshipping God and manuring the field will not be without reward.
  - 16. Relatives will not be as serviceable as mannre.
- 17. Crops without manure are as worthless as a flower without scent.
  - 18. As the rubbish heap rises, the ryot prospers.
- 19. A field autrodden by sheep and a maid without a bushand are of no value.
  - 20. One kind of soil is manure to another.
  - 21. The foot of the sheep is of gold.

#### brigation.

- 22. Crops without water are just like unoiled hair.
- 23. Water and a thief should he secured at any cost.
- 24. Do not attempt to water a field except by natural flow.
- 25. If you take care of the well, the well will take care of your stomach.
  - 26. Sink a well where there is an Aut-hill.
- 27. In a sandy stratum, the deeper you bore the deeper the water.
  - 28. Though you allow shade, allow no water to stand.
- 29. It is easier to conduct the duties of a Tabsildar (Mamlatdar) than to distribute water.

#### Weeding.

30. Hoe your standing crop, rather miss sowing in the season.

- 31. Manure the field till the crop begins to car and weed it till the cars are ripened.
  - 32. One who weeds thoroughly has a treasure.
  - 33. Deceitful hearts and fields foul with weeds will never thrive.
- 34. A field overgrown with *Hartali* grass and a man who opposes his king will not thrive.
- 35. The hashand of an unruly wife and he who cultivates a field full of Harrah grass will be rained.
- 36. A house with a harlot and a garden with Tudana (a kind of weed) go to rum.

### Further Observations on some Drought Resisting Plants of the Deccan.

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N the Poona Agricultural College Magazine, Vol. III, No. 3, page 200, preliminary observations on the subject of drought resisting plants in the Decean were recorded. The plants enumerated there were classified into two sections—Section A-representing such as had commenced to exhibit signs of distress even at the outset of a trying sensormenced to exhibit signs of distress even at the outset of a trying sensormenced to exhibit signs of distress even at the outset of a trying sensormenced to exhibit signs of distress even at the outset of a trying sensor section B-contained these which seemed to face much better under the same circumstances. Since then, to the time of compiling these results (June 1912) no fewer than twenty-eight to thirty completely dry weeks have passed away. It is simply wonderful how some plants have successfully withstool the ordeal of such a dry season, the plants not having received any hand-watering or any of the recently studied cultural operations for the preservation of water in the soil.

The same limited truct as was mentioned before, was observed in the last week of May and the first half week of June, 1912. The result of the observations is as follows:—

Many plants of the A list, with some exceptions, have completely disappeared, while a greater number of resisting plants appear in B list. The percentage of survivals is twenty and twenty-eight respectively.

I give below detailed notes on each of the plants as recorded in my note-book.

Plants which surviced from A list.

- (1) Lagrana moltes.—This was previously a very stunted plant, only an much high above ground in some cases and in others the individuals spread on the ground covering it the distance of nearly five makes all round single plants. The maximum depth to which such plants sent their roots was up to 9½ inches. The leaves were partially carled back.
  - (2) Bauhinis tomintosu
    (3) Phimeria aculifolia
    (4) Wrighta tomealosa
    (5) Nyctanth's arbortrists
    (6) Draylum indicum
- (7) Canna indica. Strong plants only lived of the end of the season.

Plants from B list.

ſ.

- (1) Launea mudiculis.—This looked very mergre, leaves spreading, dark coloured, stimulating that of the soil underneath, with white midrib and spinescent margins.
- (2) Phyllanthus madras-patanensis.—This spread on the ground to a distance of 10 to 12 inches and the main root was as deep as 101 inches.
- (3) Tridax procumbens.—This is now a thin and very emaciated plant flowering abandantly.
- (4) Corchorus trilocularis.—The plants collected are 16 inches high with 3 to 4 branches or stems, having 28 pods. The seeds are ripe. The plant is growing quite well so far.
- (5) Rhyacosia minima.—A rather weekly plant spreading widely on the ground with no less than niuniuflorescences in a stem of scarcely 10 inches long, each inflorescence bearing 3 to 4 ripe pods.
- (6) Tephrosia purpurea.—This is the only plant which maintained its full groenness and health during this drought and can be depended upon to persist in the worst times, if any material of economic use is derivable from it.
- (7) Dodonea riscosa.—This is a common hedge plant which also maintained itself through, in some very dry situations, this also had commenced to show distress.

- (8) Argyrea cuneata.—
  (9) Cryptostegia grandisflora

  These two, especially the latter are remarkable for rething yielding the lad weighted.
- (10) Gualacum officinale.—Remained well in an unwatered but slightly shaded horder.
- (11) Ischoemum pilosum.—(Kurda) The portion above ground had all deel but the roots undernouth were ready to shoot up on the advent of wet weather and so they did in July.
- (12) Andropojon Lauronu.—This grass retained vitality in the tufts which had become pressed to the ground. This grass can be depended upon to a certain extent to give some cutting beloed in its growth by special moisture-retaining culture. Immediately on arrival of the rains it formed a tuf.
- (13) Cenchrus byforus.-This is another grass which through dying at the top retained vitality in the roots under ground and grow up early in July.

Plant outside list B & A-

- (1) Cocculus villosus.—This seems a stubborn weed which lived well through the year though it dul not develop an extended stem and branch system in exposed situations. It fared well in shade where its branches trailed a long way.
- (2) Abution muticum.—A small plant about 31 inches high which could be seen on dry land at the time. Many plants of this were perhaps from self-sown seed which had germinated from the httle moisture of this year's rain rainfall.
- (3) Chlotis barbata.—A grass which formed under ground strong suckers wherein vitality remained, and the plants sprang up immediately on the first appearance of moist weather.

## Cottons of Gujarat.

(Continued.)

BY

#### K. D. Kulkarni.

( Cotton Supercisor, Korthern Division.)

#### Ahmedabad District.

 Ahmedalad to Palanpur. From Ahmedahad to Palanpur the soil is goradu. Near Ahmedahad it is very similar to that at Nadiad while further towards Palanpur it becomes more oud more sandy.

Cotton is grown up as far north as Silbpur, the neighbourhood of Ahmedahad growing Rozs, and Latio, while Silbpur grows only Latio. Near Palaupur uo cotton is grown, hecause the lund is full of white onts and cotton growing is hence impossible. Round about Ahmedahad o few places have a clay soil, and even a black soil like Sunt and Navari occusionally occurs. ( In these areas the types suited to these places appear suitable.)

In the area under discussion, the yield of Rozi per acre is about 300 lbs., and that of Lalio about 400 lbs.

The land is mostly occupied by rab crops of wheat under irrigation and rape seed and eister without arrigation. The water level is quite near the surface between Ahmedabal and Palapura, and so does not require a los, and only a dhebad or hand-lift is used. Here the chain pump will do well. The Palaupur neighbourhood requires a loss of the Decembrye.

This tract, but for white ants, would have been very useful for tree cotton cultivation, as there a band unce of water. Round about Mehrana the land is of black colour which will suit Narsaricotton. Rice is taken as a Khary crop in several places where the land is low or by seed making cunbankments in the less sandy soils.

2. Ahmedabad to Idzor Road. The laud from Ahmedahad to Idaor Road is goradu, becoming more sandy towards Idar.

Latto cotton is grown from Ahmedahad to Naroda, a distance of ten miles from Ahmedahad, gorada while further up there is no cotton of any kind. The cotton is of the same quality as Bauta Latto while Navsar; can be distributed round ahout Naroda and Asarva.

The portion towards Pranty near Idar is mostly used for growing bajrs, math, butley and wheat. The yield of cotton per acre here is about 400 lbs. Cotton is not the principal erep of this tract, and is not rarely grown here and there. No definite rotation is, therefore, observed for it though, as a matter of fact, bajrs is generally rotated.

3 Dhandhuka Ranpur is the first place of Dhandhuka Taluka we meet, round which Mathio cotton is being grown. It has extended largely within the last three years.

From Raupur on our way to Dhandhuka, the first thirteen miles, Ward and Matho fields are seen growing side by side, Mathio being greater up reportion towards Raupur and Wayad increasing as we approach the thirteenth mile. After that, the next five miles upto Dhandhuka, pure Wagad's grown and round Dhandhuka, within a radius of five miles, only Wagad's grown.

Though it is commercially pare still there is a mixture of Lalio wherever we see Wagad in the Talaka, and that mixture is partly doe to the slightly impure seed and is sometimes made intentionally to improve the colour of Wagad.

The soil throughout is light coloured "black" has Navari except some five thousand acres near Dhandhula on one side where it merges into goradu, and is very retentive.

Until the list four years Mathio was considered a very heavy yielding variety and bence its larger spread but litely it does not appear to have yielded well; and so for trial round about Hanpar, people are willing to take small condities of Navarie seed.

Near Dhandbuks where Wagad is grown, Kahanmi (Droach Deshi) is not preferred by the people as Wagad on the whole gives more lint than Kahanmi. Though Wagad gives only 33°, and Andanni 33°, and though Kahanmi lint is valued one rupes more per mund than Wagad, yet the total return per acre is greater from Wagad than from Kahanmi.

Some years ago the seed of Wagod from Virangaon was distributed by the agricultural department in Dhankhuka and the people there are willing to take thriseof from Harpurs place near Vicumgoon frumous for Wagod, to sow it in the tract round about Dhandhuka within a radius of five miles. Feeple mear Dhundhuka thuk that round about Dhandhuka Kadamsus cetten grees more left than Wagod but a crop of Kaharani under trigetton, within three miles of Dhandhuka, I found, was very rood and had no such fault. 4. Bhal. Beyond Dhandhuka commences the tract called Bhal, which inclades Dholera and where Kahannu cotton is grown to a larger extent than Wagad. As this whole tract is liable to floods the cowing of cotton is done in Angust and the umannt of Kahannu increases, relatively to that of Wagad if the rains be good. Here also, light soils are always grown with Wagad cotton. I num of opinion that there is considerable opening for the distribution of Broach seed in Bhal, but the quantity of seet in demand, will largely depend on season, us there are neither wells in that Taluka, wherewith irrigation can be done, nor is the soil suntable for irrigation, as both water and soil are liable to be saltish.

But in rare cases under arrigation where water and soil are good, the Kadanma is satisfactory and the staple is equal to that of Surti Breach.

The sample of Kahanmi in the neighbourhood of Bhal is very much like the Lalio of Banda.

Mathio as a variety of cotton has some epecial advantages for which its area has been increasing till now.

- 1. It yields hetter and earlier.
- 2. It is picked before the plants suffer from frost as other varieties sown in late scason are liable to do.
  - 3. It can be grown where the rainfall is short.
  - 4. It is useful to mix with Wagad to improve its coloar.

The average yield in a good ecason of these varieties in pounds is as follows in different parts of the Taluka:—

Variety.	Taluka.	Talula.	Taluka.
Mathio.	Ranpur. 500	Dhandhula. 400	Dholera or Bhal. not grown.
Wagad.	300	-100	400
Kahanmı.	250	300	400

As most of the Bhal cotton is gunned at this place brings a better price by a rupee over the Wagad cotton ginned at Dhadhuka, while the Ranpur gin being a mixture of Wagad and Mathio's less in value by one Ranpee even than that ginned at Dhadhuka.

#### Kathiawar.

 Wadhwan. This state grows unly Kahanmi and Wagad cottons, as the people are prohibited here from growing Mathio. The soil of the tract is reddish in places with stones at the surface in many fields, while below two feet there is yellow marrare and helow that white kankar.

This reddish tract grows Kahanmi better than Il'agad as it ripons earlier and thus suits the shallow soil, while a portion of the state that is of black soil, grows Wagad better than Kahanmi. The yield peracro is 400 lbs. of each variety. Some people prefer Kahanmi to Wagad for earliness, as it is thus less liable to winter frost and also yields a little better ure reddish soil.

The fibre of Kahannu is like that of Broach-Deshi of Broach while Wagad is like the Wagad of Virangaon. Here the water level being nearly 50 feet below the surface, there are very few wells and so no watering is given to cotton. Be-dides, these wells have not got an abundant supply, even when water is actually reached.

- Wakaner. The tract from Wadhwan to Wakaner is rocky and even grass does not grow well over rouch of the country. But at Wakaner and round about, there is large cultivation of bajri, jouar and cotton, the rotation being cotton-jou ar-bajri. The cotton grown here is roostly Wood and much of it is irrigated like the Bayla cotton. The arrigated crop yields 1000 to 1400 pounds per acre compared with a dry crop of 500 pounds per acre. Kahanma also is grown in lighter soils and it vield; hetter than unirrigated Wagad in such soils. It would seem that some portion of the state that is lighter, could be well ntilised to grow Mathie cotton as that tract being unsuited to Wagad or Kahanmi does not get the epportunity to grow the paying crop. For the present the state pllows only Kahanmi and Wagad to be grown, the soil is reddish, medium black and Goradu. The water level is twenty feet from the surface. Irrigated Wagad yields better than irrigated Kahanmi and has a better ginning percentage (35-37%). On the Joshpur side of this state the land is more suited to Wagad. The fibre of Wagad and Kahanmi is very similar to the same varieties grown in Ahmedabad and Broach respectively.
- 3. More. From Wakmer to Morei the tract is mountainous and the soil is shallow. Though here and there, there is some collivation of cottoe, the crop is poor. This tract, I think, will suit more for Matho than for Waqad which is now grown here is some places.

Another portion of Morss, from Morvi to Jetpur is light black or medium black and here, cotton and Jowar or cotton and Bajir are votated. The whole state is almost devoid of wells and so the present variety is sown. Wagad does not prosper well but remains much stunted and is also liable to frost. If Kahanmi that ripens early here in December-January be sown, it will yield better than a dry crop of Wagad. The tract northwards near Vavania is composed more of good black soil and it is good for Wagad as this soil can retain moisture better than that near Jetpur.

On the whole, cultivation of Mathio and Kahanmi will snit better to some tracts of poor and medium nature than the present method of sowing Wagad everywhere. The eastern portion near Tankira grows a little Mathio but that tract grows very little cotton of any sort. The average yield is 250 to 530 pounds per acre, while there are very few fields yielding more than 400 poands per acre.

The rotation generally observed is cotton-jowar.

4. Rajkot. As there is a canal near Rajkot, the cultivation is mostly of irrigated crops such as sugar-cane, wheat &c. but further east there is the cultivation for Mathie and Lalie, Mathie occupying more than three quarters of the cutton area. The soil is medium black nearly two to three fect in depth, while below, there is generally trap rock.

As we go further and further from Raykot on the sonthern and western side the lard is better. Here *Lalio* was more in cultivation ten years ago but now *Mathio* is being grown more on occount of scarcity of rain.

Here on the canal side Markio also is irrigated once or twice and the yield improves by nearly 200 pounds per acre.

The yield of Mathio here is 400 pounds per acre, while the yield of Lalio in good soils is a little more, say 450 lbs.

The tract where Lalio is grown being without the means of irrigation, away from the canal this variety is always grown as a dry crop. The northern portion of the state is mostly rocky and there is very little calitization.

5. Jamnagar. Round about Jamnagar there is no cotton cultivation antil we approach Raykot but the Talakus of the Jamnagar state that are near Gondal are full of cotton cultivation. People here and there near Jamnagar are trying cotton but the yield seems too small to pay. Here bajri, jourar and wheat are the principal crops. The southern portion of Jamnagar state is in continuation of the northern portion of Rajkot state and so is equally rocky throughout, except some ten miles southwards from Jamnagar.

The cotton that is being grown at Jamgodhapur of this state is Mathio. The land is medium black of very little depth here, from six

inches to two feet-and no other better variety will grow here. The crop rotated with cotton is bajri.

6 Gondal. The northern portion of Gondal almost touches Raj-kwhile the southern portion comes up to Jetahar. The chief cotton tract is Jetahar and Dhoray where only impure Markio is grown extensively. The land is composed of medium black soil of from six inches to two feet deep. Bayrs is rotated with cotton and no other better variety can be grown on this soil.

Near Goudal the same cotton is grown with plenty of mixture of Lalio.

In the dry area Mathie with a elight mixture of Lalie is grown, while in prigated lands there is more of Lalie and less of Mathie mixed with it. Pure seed of hoth kinds if grown separately will be better in yield as Mathie in the dry area will grow well while Lalie in the irrigated area will yield still better. Pate seed of Mathie is available near Junagad. The crops rotted in the irrigated area me bajrs and wheat while in the dry area boyrs alone.

Near Dhoraji, the cotton grown is the same impure Mathio. The land is medium black of from two to three feet deep and is smited for this variety. If there is the mesar of irrigation Lalio under irrigation will grow like Bayla and will yield much better than Mathio.

 Porbandar. Porbàndar is not a tract of caltivation but of stone. It has got the sea on two sides while the third is of stone. Only one side Porbander to Junagad has got caltivation and nearer to Junagad, cotton is grown.

The tract from Porhander to Ranvav, up to which this spreads in the same direction as the railway, grows Wagad cotton here and there. The yield seems moderate. The soil where cotton grows here is medium black while the rest of the country is very stony. Dajri or jowar are rotated with cotton. The tract on the Jansgad side of this state grows cotton of the Mathao type and the yield per acre is nearly five handred pounds.

8. Junagad. The tract from Junagad to Veraval is mostly of motion black soil and well suited for cotton except within a few miles round Veraval, which portion being salty is not suited for its cultivation. In this state the light black soil six inches to eighteen inches deep grows Mathic cotton of very good quality. It has a fibre hetter than Jari and almost equal to Basi in length and feel.

If pure seed of yellow Mathio be supplied or selected by the people and giuned on hand gins for seed purposes, the quality will pay for this extra labour.

Portions of the state where the soil is deep grow. Kanci cotton, and that crop also is very good in yield. It has no mixture as the mixture curbe easily detected and removel. The trust of Jinnagal touching Gondal State grows white ilowerel Metho and that seel is being sown in some light soils in Jinnagal State in place of yellow flowered Mathio. I think this should be stopped as this variety is spoiling the quality of good Matho and this alreads spatel pure Mathio by almixture of seel. So yellow Metho for light soils and Kalanna for dry soils will keep up the quality, if the sowing be rotated, on these two kinds of soils, of these two varieties. These will not mix generally as both ripen at differentiams. The yield per acre of Metho exition is five to six hundred pounds per acre. Journ and begre are the crops rotated with cotton in alternate yours, while where is well irrigation Byn is followed by wheat and then cotton.

Roun I about Junigal city, Michio is grown while after some ten miles from Junigal continueds Kinci is grown. As we approach Venwal agun there is Michio as has alreally been described.

- 9. Decreta. From Dearky to Arun'ty State the hard is sandy load but is much impregnately with sult and only grows castor, bying and jovers and a few other crops. The cotton crop was tried in this tract by the State but it yields not even one bundred pounds per acre. It is peculiar to note that while in the Surat district within a distance of ten miles from the sea, the hast cotton is grown, while also in Mr. Molison's book it is the sull that the sea becaze tends to bring about a better quality, here the results are quite contray. Here the soil is six inches to three feet deep, below which there is marrom and yellowish or reddich stone. It seems "castor is the best plant for salt half". It is growing here well and in plenty and instead of cotton if the castor silk industry be communed after it has proved to be profitable, it will be a good lon-ine-s for the people who are almost without any acricultural means to muturin themselves.
  - 10. Arreli. The truct from Chital to Amreli and round about Amreli is of light block soil of six to eighteen inches deep, though in some places it is not even three inches deep. This tract grows Mathio cotton but the soil being poor, the fibre is shorter than that of the Junagad State. It seems that Broach will not grow here as the soil is

light and the rainfall short, but it seems that if fresh seed of Janagad Mathio from near Verawal might be tried it will keep up the quality for some years. Here the yield is four hondred pounds per acre:

The crops rotated are journ and sometime bajri with cotton. It seems that bajr cotton gamen here as growing well and that it is also worth further trials. It was grown on the experimental farm here with good results but with irrigation.

11. Bharmagar. The tract from Chital to Bhuvungar and on the Ghogha sale is of high black soil six to twolve inches deep below which there are white or yellowish pieces of stons mixel with a little curth, and further down marms. The cotton grown in the whole State is Mathie. Kanes, which was being gmwn here before the famins of 1890, has almost gone out of existence. The crops rotated with cotton are days on a large scale and journ in a few places where the soil is sufficiently deen.

This tract also gets about twenty inches of rainfull like Palitrus and the same conditions prevail here. The fibre of Mathio here is almost like Khandesh cotton and in the general crop there is a predominence of white flowers over yellow flowers. The yield per acre is nearly three bundred pounds. It seems that the fibre of Junagud-Mathio is the hest which as we go from Junagud to Bhanagur it gradually decreases in length and feel so as to be only equal to Khandesh cotton. The same graintic change takes place in the proportion of yellow flowers plants in the crop. The tract from Ehrwangur to Limbili is of me liam black soil and here also Mathio is grown but as we approach Limbili some fields are seen of Warade cotton, some of which are irrigated.

12. Pallana. The tract from Sougrd to Paltana is almost of light soil with six inches depth of earth only below which there is the maram. The tract grows cotton of Matho kind and it seems that no better variety will grow here except Matho of better quality like that from Juneau.

On the State farm different kinds of cotton were grown. Ont of which, Khandesh, Mathio, Korheli and Bura are primining and worth trying longer as they have got a kind of superiority over the local, in yield or quality. Here Khandesh and Mathao are much better than the local, while Korheli and Buri though better in quality give a lower yield. Latio grown here does not ripen as the bolls dmp down even though watered and hence it does not seem to suit this tract.

The portion of black soil of three feet depth on the Rathanpur side I saw but that also suffers from call and shortage of rain if Latio be grown, while Mathio grows here well. On the whole it seems that this State is suited for Mathio and Khundesh and not for cotion of the Broach type. The rainfall here is twenty inches while Kathiawar as a whole has a much smaller rainfall than Gujarat proper. The yield per acre is two to three hundred pounds. The crops rotated with cotton are Bajri and Jowar.

13. Limbdi to Virangaon. From Limbdi to Virangaon the soil of the tract gradually changes to clay and Limbdi chiefly grows Wagad and Kahanne in almost equal proportions.

The rotations usually adopted are like Wadhwan and the whole as the smaller to Wadhwan. But beyond Wadhwan as far as Virangaon, the whole portion of somewhat light textured but clayey soil grows only Wagad and that also of good quality. The rotations adopted are the same as at Virangaon. Here the whole crop is taken without watering or irrigation.

### Rabies in Horses.

EA

#### F. Gracias,

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FILIS much dreaded and fatal disease has long been und still it is remains very common in India among dogs and other domestic nominals. It is very probable that the wild prokal is the primary cause of rabies in dogs in smuch as rabel packals are often very futions in that state and late anyone, puttenlarly dogs who are in the habit of night rambling. Man, inocalated with the saliva of a rabid animal soon develops symptoms of hydrophobia and shows a peculiar dread for water a sign which is very characteristic. It is very surprising however that this particular symptom is not at all seen in cannes. It is known that pakes affects all animals both wild and tame, and man is no exception.

Recently a horse was brought to the veterinary hospital attached to the agneultural college, showing signs of great nervousness, an inclination to life the breast and restireness. His conjunctiva was somewhat injected; he had a slight cough and his temperature was about 1027 F. He was accordary given a stimulant expectantal dench.

On the following morning however unmistakable symptoms of rabies suddenly developed; he became very violent and unapproachable, his pupils dilated to a large extent and his eyes had quite a vacant stare in them. In a few minutes he had his breast and off fore cannon all mutitated and torn. His appetite was good and he ate his grain feed as usual and the large quantity of hay that was placed hefore him he was eating voraciously.

After about an hour and a half to two hours water was shown him when he was saideally attacked with spasms; he would extend his neck and attempt to drink water but would on no account touch the water or rather as he tried to approach the water he would quickly withdraw again trembling violently as if there was something very dreadful in the water which caused the fright.

This shows that although dogs and similar unimals do not as a general rule dread water, still bores show a very marked fear for it as will be seen from the above description. Goats behave in this state as dogs; in a case that came under my notice some years ago, the goat seemed not to care much for its food but would, it appeared, eat earth, faller, with relish and when disturbed would at once attack the aggressor with its borns and teeth.

The horse under consideration dad not nt first late or kuck but later, in the furious stage he would allow nebody, not even his own syce, near him; in fact if any one dul venture to approach him he would rush on him and late him or quickly turn round and kick him.

The animal was then shot nuder instructions from the Superintendent, Civil Veterinary Department whose advice was asked by the owner, who had himself been injured by biting, and who had to nudergo the treatment at the Coonoor Pa-teur Institute. The hrain of the horse was removed and sent to Coonoor for examination; the Director of that Institute in course of time informed us that the horse was truly rabid. Cases of rabid horses are relatively so infrequent that a description of a case which has come so recently under my own notice must have considerable interest.

## The Consolidation of Earthen Embankments.

...

S. S. Godbote, L. C. E.
Assistant Professor of Physics.

RRIGATION is allied to agriculture so closely that where rainfall is scanty, it may be considered to be the very life of any success in agricultural practice. In such districts, in the absence of irrigation the whole year's work of a furmer is apt, in Western India, to be reudered useless, owing to a fullness of the run. In such a case irrigation is so closely connected with real agricultural success that a few remarks mbout the construction of works connected with that branch of engineering will, it is hoped, be of use to those interested in Indian cultivation.

A few years ago I was in charge of the construction of a few miles of canal ( Godaveri Right Bunk Canal ) which takes its supply from the river Godaven in the Nasik district. Here I found that the embankments intended to hold the canal water were consolidated by men with iron rammers nine inches in diameter provided with bundles four to five feet long. The consolidation was done with these as the soil was laid in place by the workers. The cost of consolidation came to three annas per 100 enbie feet of soil laid in the bank. However the consolidation done in this way was very poor. An onlinary walking stick could be driven in a thoroughly consolidated bank to a depth of more than two feet. These banks were, moreover, found meanable of holding the canal water without leakage. This was made manifest in places by the subsiding of the banks to a depth of as much as three feet by the rain water which stood against the banks and by the enormous leaking of water which took place. The reasons why the consolidation was not properly done were that the intensity of pressure obtained by the use of rammers was not sufficient to effect the proper consolidation, and secondly the people that were intended for ramming the soil were employed clsewhere by the contractors thus can-ing much neglect of the consolidation for some hours in a day. To effect proper consolidation it was necessary to get over these two difficulties. The method that was adopted and which proved very successful was to use carts loaded with stones for consolidating the banks. The pressure was transmitted ut points where the wheels of the carts were in contact with the banks, the intensity of pressure being sufficient to bring about proper consolidation. The contractors having no work in which they could employ the carts in any other way had to keep them working on the embankments and the consolidation was thin in progress for the full day. The rate at which the work could be done was one anna nune pies for every 100 cubic feet of earth. One cart was paid at twelve annas per day and this was sofficient for seven hundred cubic feet of earth. The consolidation was perfect. A walking stick could not be driven for more than three to six unches in such a bank. Farther it was observed that there was some, thing in the feet of the bullocks which helped the consolidation. For, in a certain place on account of the introvwess of the banks the carts were drawn by men unstead of by bullocks and it was found that the consolidation in this case was much inferior. The lead that was put in the carts was in the form of rubble. The total weight of the lead was adjusted in such a way as to have sufficient pressure for consolidation and to allow the bullocks to move with ease on the loose soil throw in inpose the banks. This weight was four hundred pounds per cart.

## Chillies as a Dry Crop.

BF

#### K. K Bhatarkar.

EXILE following article gives a short sletch of the method of chillic the cultivation precised in a few villages not far to the south of Surat, and is the result of some years' observations on my father's farm. As the cultivation of chilhes, as a dry crop, is practised in very few places in Western India, the subject may be found interesting as an account of a novel method of growing the crop.

Before we begin with the subject proper, it is of primary importance to give an account of the special variety grown and a description of the fruits as well as of the plants. The name by which this variety is known in the market of Surat, is Althan marctan, Althan heing the village where they are produced of the best quality and in the largest amonus. The Pants belong to a variety of the

species Capsicum frutescens. The plants when well grown, attain a beight of nearly two and a half feet and when fully branched, cover an area of nearly two feet square. The fruits vary very much in length, the biggest being not more than three inches. The epidermal skin of the fruits or the so-called pericarp, as thin like paper and shines with a peculiar bright lastre. The colour of the fruits is durk red. They rank second in the brazar for their pangent taste and the examess with which they are powdered in the monsoon, thu first place being given to laxengua marchan of Poons Kambharia, near Sarat, which belongs to the species Capsacum manuam.

The soil on which the variety under discussion is grown is light yellow in colour and termed yourd by the enthwaters. It is alluvial as character. Lamestone no lules are generally found internuced with fine particles of saul and chy. It is easy be tallage and allows a free drainings of water. The market pocultarty of the alluvial soils in this neighborhood—that they do not crack in the lact weather—is shown by those on which these chillies are grown.

The soil is manured every alternate year with farm-yard manure of which nearly twenty cart-loads are sprewl per acro. It is worthy of acto that is addition to this farm-yard manure, a second kind of manure, i.e., castor cake is given every year. The question as to how it is spread will be dealt with in the privage on inter-tillage. After manaring, harrowing begins. Two to three harrowings are given and if the rains come late, even more are required. The soil requires a thorough ploughing before transplantation and therefore two ploughings are given after the first light rains.

The seed hel is propered in the second week of Mny. The quantity of seeds required per acro is nearly non pound and a half. The work of growing seedlings, i.e., making bels and watering them when required is generally taken up by the farmers who have got conveniences for growing graden crups. After the first watering, the respective owners cover their bels with leaves of kinjuri, a variety of the toddy palm. This protects the seedlings from the sun. When the seedlings are two inches high, these leaves are removed and the bels are weeded. The owners weel their bels again and again if required.

After the fall of the first heavy rains, the seedlings are transplanted. The space kept between two plants is two hats, a distance equal to nearly twenty-onn inches. If the seedlings are big, the tops are cut off. This process of topping the seedlings helps a great deal in bringing about the rapid rooting of the plants, as they are much less

affected by the wind when topped. Twelve to fifteen seed-bods are required for transplanting one acre.

Inter-tillage.—As soon as the first rains have stopped, the process of castor cake manuting is precised. Seren bundred pounds of castor cake manute are given every year per acre. The process of supplying this manner is a curious one. Ten or fifteen days after transplanting, the farmer takes with him labourers and gives them this castor cake powher in haskets. The labourers make a circle round the plant with a detard—a weeding implement by which the roots cannot be injured—and the the ground. The soil is removed and the manure is thrown in the pit evenly. Next, the pit is again covered, After this manuring, interculture is given and the field is weeled. Three weelings and four interculturings are generally given. When the plants are discreting, cross ploughing is practised, by which is meant that the limit is ploughed from worth to south and east to west, forming a sort of rectangle round the plants.

The first picking begins three months from the time of sowing, the average outturn at this time being nearly one bundred pounds. After this, the pickings are curied on at on interval of twerty days. If the chillies are to he picked unipe, nearly five pickings are taken, but if the farmer wishes to take ripe chilles, only two pickings are taken, but if the farmer wishes to take ripe chilles, only two picking is about 700 lbs. Ripe chillies are picked twice, and the interval between the second and the third picking is nearly thirty days which remains the same between the last two pickings. At the time of the list picking, nuripe as well as ripe chillies are picked, and the plants day only marketed for fuel. The outturn of ripe chillies is 1909 lbs. which when dried weigh 650 lbs. The surripe chillies of the last picking amount to nearly 259 lbs.

Pests and discrete.—The sendings are generally attacked by broods of caterpillars. Cutworms generally affect the plants when they are freshly planted. Another kind of discress also attacks the plants, affecting the leaves greatly which become folded and drop off, thereby checking the growth and flowering of the plant. Some species of bigs are also found attacking the plants. In conclusion I venture to give an account of the cost of producing the crop per acre.

Items		Cxpend	iitu <b>r</b> e.	Income,		
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## Colleges News and Notes.

EFORE referring to college news, we wish to inform our readers and particularly our students that it has been proposed to open a Correspondence Column in the Magazine. We shall therefore be very glad to receive correspondence, consisting of inquiries or suggestions or improvement in anything connected with the College or Agriculture in general, ar with reference to the articles that appear in the Magazine. This column we trust will be a means of giving to the public an opportunity of applying its mind to many a knotty point which often remains unriddled through ignorance of the sources for information. We shall feel much pleased to see our students taking a special interest in this column and making a determined effect to bring difficulties before us or to colve—as far as lies in them—those of others. These questions and answers will be published regularly as far as practicable

When last we went to the press, we had observed that the College Farm etood have and here no signs of that charm and pleasantness which the living plant bestows on it and gratifies man as nothing else does. We are glad that we can record now the solace we received towards the end of July in the plentiful rain which dispelled our worst fears. The rains came with a vengeance, as it were, to quench to the full the thirst of the land. There was a constant downpour from the 19th to the 22nd of July, the average during these days being nearly 2 inches with a fall on the farm of 3-41 nuches on the 21st. This, we must needs say, occasioned as much alarm-if not more-as the previous drought had done. Kirkee was flooded and water to the right of him, water to the left of him water above and below, in front and hehind, was the Kirkee resident's lot. The students' quarters near the Kirkee Boat Club appeared to be a launch chartered int an excursion towards the Sangam. But for the timely cessation of the rains, the champion swimmers of the college would have had a swimming bath in their rooms. The River Sangam reached the highest flood level very close to the springing line of the arches almost endangering the stability of the Wellesley and Railway Bridges and from here onwards the floods caused grave anxiety. The college was closed for the 22nd as it was found in the morning that there was nn possible egress for the students staving at Kirkee.

The black soil on the farm was moistened to a depth of 10 inches, and the light soil to 13 inches. Crops could hence be snwn at the scallest break. But the break seemed never to come, daily showers on an average of 25 cents causing the soil to keep wet and preventing all field operations. The sawing of eraps was begun on the 1st of Angust a date particularly antimely für kharif powar, entten etc. But again there was no regular stop in the rains and a strong pour occasionally checked the fieldmen in their work.

With the amount of more tree resulting from 13 inches of rain on the whole, in the end of August, the crops have been thriving very well and the students' eye—engerly serutionizing nature's beauties through microscopes and in books during the day—feels relieved at eve in witnessing the farm decked out in a ventant gloss.

This year again is for us a year of deeper study in the problem if the methods and necessity for conservation of moisture. For the late rains appear to be very weak and the hot sun since the end of August has been causing the soil to cruk. Insert pests are also rife and are doing a great deal of durage. Though precantions are hoing taken for their destruction the general conditions of the late mouseon and late sowing this year have eachled their rapid spread and made it difficult to combat their attack effectually.

A few showers more would undoubtelly improve the present condition of the firm and crops, but whether we shall get them remains still a question.

On the 18th of July the University Commission composed of Rev. Dr. Mackean, Rev. Fr. Sterp, Dr. Rutchenson, Dr. Mann and Mr. Birchbla, pvild a visit of anspection to the college. The Commission was estisfied with everything that Dr. Mann though one of them—bad as Principal to show them. They could not have wished, we believe, for anything better than the axisting order and arrangement, except that the large lecture-rooms be filled very much more than they are naw. In connection with the Commission, Dr. Maon's name in the list is a gen of appreciation for us, though we know that this addition to his duties is a piling, as it were, an Osa on the Pelion that is inleady on shoulders in the variety of occupations that take up his time and energy. But from what we have seen and are daily seeing of him, Dr. Maun will match Herceles in his addities,

The college students were to make a trip to Lonvits on the 10th of langust for the study of rice—transplantation in that tract. An infore-sen accident on the line unfortunately kept them back when they were already at the Posua station very early in the morning. They had to make the lest of their disappointment by ntilising the ontents of their haver-acks on a picnic party in the station. The S. Ag, students however went some time later with Mr. Kavargode and Mr. Chubber to Khruddals to make an oel-door stady of Entomology and Poology. We regret not to be able to give an account, of their three days' experiences there, in this number for want of space. It was the first of its kind undertaken by the students themselves. They must surely have gained very much by it in the board of information that the professors gave them in a nutries own bunnts.

The annual F. Ag, and B. Ag, tones will commence about the middle of October. They have not yet been outlined but will probably cover—with a few exceptions and additions—the same tracts that were visited last year.

We would here like to remind the tourists again to carry their pocket books with them and bring them back filled with observations which will be neeful for the Magazine. The editors will be extremely obliged.

Prof. Knight, we are sarry to say, met sometime ago with a lad accident. His horse sudlenly contracted symptoms of rubies and before this was known he was incuttle; through a wond on his figger, with the subra of the animal while dreaching it. The horse had to be shot adsequently and Prof. Knight was advised to leave immediately for Connoor for the Parkeur treatment. He was any for a fortnight and though his absence caused some little disargunisation in the usual course of lectures we are glad he was able to leave for the cure before authing serious could happen.

We have an unpleasant prospect before as in the fact that Itao Sabeb Kelkar is shortly leaving the college on a year's furlough. All will admit that he well needs a long holiday, yet there's not one that will not regret his departure at a time when we most need him. We wish him, all the same, a very pleasant holiday and a speedy return back to the college. Mr. Ranades, Superintendent of the Dharwar Farm has been appointed to take his place. We can never forget Mr. Ranades,



B. Ag. Students at Horticultural Work in The dangeikinn darbens

condial hospitality during our tour to the Dharwar Farm and we have overy reason to expect that we shall find in him as good and kind a professor as Rao Saheb Kelkar.

The college hall has during the past quarter been resonnding on more than one occasion with the eloquence of the members of the Decean Agricultural Association. Three meetings were held, at the first of which Prof Burns delivered a lecture on the "Treatment of the Roots of Fruit-Trees" to a fairly large andience. On the 23rd Their Excellencies Sir George and Lady Clarke were present when before n crowded assembly. Sir George delivered his last address at the college. In commending highly the excellent work done by the members of the Association on behalf of the coltivators, His Excellency regretted of the Association of Boundary of the Conference regiment that his approaching retirement would draw away his personal support from them. "God speed the plough? was His Evcellency's final wish, a wish which, we are confident, has ever been very dear to his heart; and fer the necomplishment of which he has during his rule in the Presidency done his very best. We wish that Their Excellencies when leaving the shores of in he feel happy in the thought of having worked and seen its welfare and we wish also that they may have nearly songe and n well earned rest at home.

A general meeting of the staff and students was held on the 28th Angust to select a day for the animal social githering and to pass the rules of the gymkliam as amended by the subsemmittee appointed for the purpose. Mr. S. R. Golfole was elected general secretary and the 22nd of Nevember fixed as the date for the gathering. There was also an interesting discussion on the amended rules before they were passed.

We are sure that our past students will heartly help towards the success of the gathering by their presence and support as far as lies in their power.

In connection with experimental research, Mr. S. S. Godbole is continuing the experiments started by Mr. Butmi on the Draught of Plonghs, an inticlo of which inperced in our last number. Mr. Godbole has kindly given as an article for this number and we hope to oblige our readers in course of time with the results of his experiments.

The result of the seed-drill competition cannot be published as it is not yet known. Experiments for testing the drills could not be undertaken till the beginning of August on necenut of the scarcity of

ram. Various seeds have been sown with each of the drills and we are awaiting the decision of the pulges as to which satisfies the specified conditions for the covetel honour. It is highly grarifying indeed that this great prize of Dr. Mann has given an impetus for the exposition of the latent skill and ingenity of many people in the presidency. And from the variety of drills sent for the competition, we are unclined to believe, that with the aid of enterprising people of means, the mannfacture of agricultural implements in India would have a good future.

The first torm of the College closed on Angust 30, and most of the students availed themselves of the fortnight to pay a fiving visit to their homes. Dr. Mann too was away during the time, in Bengal, on a visit to the scenes of his early labours in India. He had been to Dargeling where we hope the cool climate briced him up after the oppressive heat of Poora. The students too, we presume, have had jolly days at their own hearth and home after being liberated from the domineering was of a relentless cook at the college considers.

We cannot conclude without referring to the death under trague circumstances of one of the highest of our recent graduates, Mr. C. R. Migali. The aid news which came to as through Mr. Hiremath was one of the most shocking we ever had and it made as cry for vengeance that one of the meekest of our young mea should have been brutally done to death in his own house at Hubb in an effort to defend the ludies of his family. In him, his family loses a dear and affectionate relative; the Lingsyste community, one who gave promises of being an ardent worker for its advincement. His death has caused in its all a woned which we feel will take long to heal. Fur though, we well know that death is a debt which we are all bound in pay, we cannot reconcile ourselves to the drealful means by which Mr. Migali has been snatched away from its. We sympthice most sincerely with Mr. Migali's relatives and pay that Providence may scothe them in their disconsolate grief. And was, We springthes most whost states this life in a noble cause.

Conference and a few or with the state of the second

## The College Gymkhana.

HE cricket season was busy as usual. That there are many entities thusiasts for the game—though few only can really handle the willow—was visible in the eageness with which they tried to find occasionally a hole to ereep out of the lectures when an interesting match was being played. Our luck in the Shield Competition Match was exceptionally bad, the Fergusson College completely checkmating us. Mr. Rebello's good bowling was responsible for the larger number of the wickets of our opponents and if only more of our standants would draplay a keen interest in the game we shall have a chance of getting up a good team.

Tenns can never full to have its patrons. The court is always compiled and it looks likely that there will be a very large number of entries for the competition which is to be held before the Social Gathering. The tennament will probably commence before the tours, as there will be very little time on return to finish them in time before the annual gathering when the champions will have to receive their laurels.

Hookey matches have been played several trace in the past quarter. The hockey team has been by far stronger than the cricket team and it has made a very creditable show in all the fixtures. The police team has been very kind in allowing us to practise sometimes on its ground.

The meetings of the Delating Society were held with success during the past term and we bud on two occasions the honour of the presidentship of Prof. Dixit of the Fergusson College and Rao Babulur Godlole. As a result of a discussion during one of the meetings, it was proposed that an attempt should be made to send an Indian manufacturer to Europe to make a study of the European methods for the manufacture of implements. The scheme is a very laudable one and we should be proud to see it succeed.

The programme of the Association for the present term we give below :—

Novemehr 4 Mr. G. G. Pundlik ... Co-operation.

11 Rao Saheh G. K. Kelkar ... A system of cropping.

November	18	Mr. S. B. Raje	<ul> <li>Possibilities of Dairy- ing in India.</li> </ul>
,,	25	Mr. V. G. Gokhale	. Fodder sapply in the
			Bombay Presidency.
December	2	Mr. S. K. Mahableshwar-	Scientific feeding of
		kar	cattle.
11	9	Mr. J. D. Devai	. Relation of commerce
			to agriculture.

16 Mr. H. B. Rajdev ... Farm life.

## NOTICE.

The Fifth Annual Social Gathering of the College takes place on November 22nd 1912. Past students and Well-wishers are requested kindly to give their hearty support. Salecriptions on donations will be very gladly received by the General Secretary,

S. R. GODBOLE.

## LIST

Books and Pamphlets in the Library

Poona Agricultural College,

# Books and Pamphlets in the Library of the

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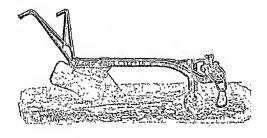
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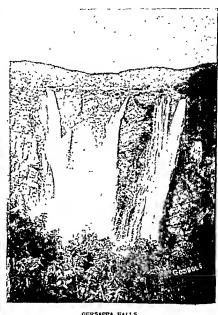
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GERSAPPA FALLS.
( View from Mysore Bunglow )

( R Ag Tour, )

## The Poona Agricultural College Magazine.

### Editorial.

IN the eloquent and valuable at frees which was delivered by Sir Narayan G. Chandayarkar at the recent social gathering at the Poons Agricultural College, he asked the question es to what was the influence of agriculture on the general ontlook of an educated man who makes it his life work. Other professions, he said, tend to unrow a man's view, and restrict his sympathy. A lawyer sees so much of quarrelling between people over petty tritles, that the world bocomes netty in his eyes. An engineer works among roachinery, -and his ontlook tands to the idea that the world of mankind is capable of heing treated as a piece of machinery. A medical man, even though his entlook is mere human, is se accustomed to eee people who are sick that his point of view is modified accordingly. Is it the same with agriculture? The speaker thought not .- end conceived that working, as he would do, in the open country in contact with the ever mysterious processes of production and reproduction, -there would be little danger of that narrowness developing which is one of the disquieting features of modern life. The idea is a striking one. Whether Sir Nerayan's view is correct depends, of course, on the man. But let us ever conceive that an occupation is a noble one: that we are indeed grubbers in the soil, but that in so doing we are the most valuable citizens of the world that exists, and that it is only by our Inbours that the world continues to exist at all : and further that we have continually before as, and we continually use and guide for our purposes, those wonderful and mysterious processes of growth and production, before which as yet we can only now bow and confess that their understanding is beyond as.

The present number of the College Magazine contains a number of articles of special interest. We trust, for example, that the report of the competition for a prize of Rs. 500 for a seed drill suitable for our conditions offered by the Principal of the College will stimulate other to improve on any of those submitted. None of those tested really reached the standard haid down, though several contained ideas of great value. As a supplement to this report, the paper on tests of foreign seed drills on the College farm will be found of great interest.

The tours which all the classes at the College have recently undertaken, and which have been purticularly successful this year, form the basis for a number of articles. For the first time in the history of the College, it has been possible to arrange to take the final year student to the space gardens of Kanara,—which represent some of the most intensive agraculture in Western India. As a result, we present an exceedingly interesting article on these gardens and their special methods. The same tour also usefed Kathiawar, and some of the notes made on that occasion will also be found of interest and value.

There are a number of other atticles which we present with great pleasure, because they deal, form personal experience, with problems which are really before our agricultural population daily as real difficulties. The question of the damage of cotton seed damag gining is a matter of urgent importance,—and we owe to Mr. I. S. Kulkarus an account of experiments to determine how for this is affected by the type of gin used. In the Decean there is no matter more inquired about by the cultivators than the destruction of wild pags. An account by Mr. Bhandward of his efforts in this direction will be of con-iderable value. The renovation of fruit plantations is a matter of great importance in a district which has been and may be as great a fruit producing centre as the Decean. Hence, Mr. Patwarthan's straightforward account of how be has dealt with one special case represents just the sort of material which this magazine desires to publish. There are many other articles of equal interest, to which there is no space to refer.

At the recent College social gathering, the project was mooted and discussed, as to whether an agricultural graduates' association should not be formed for mutual assistance and protection, and to form a link with the college in which they have been trained. A most interesting time was spent on that occasion by the large number of graduates of the College who met together, and it is to be hoped that ench a graduate and and an arrived at the summary of the staff and students of the College which is more appreciated by the staff and students of the College than the way in which old students gather together on these occasions and resume the interests and uthansiams of their college days.

As we write the agricultural prospects in Western India are far more satisfactory than at one time seemed likely. The result of the year in Gujarat, the Konkan, and much of the Southern Maatha Country has never been really in doubt. But in the Decean it was far otherwise, and at the beginning of October it seemed likely that we should be faced with a very severe farmer in Ahmednagar, and parts of Poona, Nasik, West Khandesh, and Sholapur. The rain in October, followed by the totally unexpected storms in November 22nd, have largely changed the outlook. There will still be scarcity,—but the worst we feared will not occur.

### REPORT

### On Drills Competiting for Dr. Mann's Prize.

N all 8 drills were received for competition from persons mentioned in the following list:—

- Messrs. Kirloskar Brothers, Four coultered drill. Kirloskar Wadı, Dist. Satara.
- 2. Mr. G. K. Joshi, Jamkhindi. Three coultered drill.
- Messrs. Kale and Nagarkar, Four coultered drill. Agricultural College, Poona.
- Mr. Madhavrao Deodhar. Four coultered drill. Baramati, Dist. Poogt.
- 5. Mr. Harjivan, Carpenter, Surat. Four coultered drill and two coultered drill.
- Mr. Martandrao Mandhre, Four coultered drill. Loni, Dist. Poona.
- 7. Ganesh Kalagriba, Miras. Three coultered drill.
- 8. Mr. P. R. Joshi, Amraoti. Three coultered drill.

The description of each drill with the detailed construction about the automatic mechanism of each is attached here to as an appendix. The photographs of each of them taken separately are also forwarded herewith.

- 3. In all five quite distinct principles are represented, Nos. 2, 4, 6 and 7 being a modification of one and the same principle, the other four having each a distinct principle of their own.
- 4. We will now give our opinion as to how far the several conditions laid down in the advertisement have been fulfilled by each of the various drills:—
  - The exact sale prices of drills. Nos. 3, 4, 6 and 8 have not been communicated to us. But we think that they could be made within Rs. 50. Messes. Kirloskar Renothers gave originally Rs. 55 as the sale price of their drill, but now they inform no that they have been able to offer it at Rs. 45 with some molifications.
    - All dulls have attempted this, but the automatic mechanisms require in almost all cases, some modifications to make them more effective.
    - 3. All the drills could only sow Jowar and Buri. In all cases the gap have not exceeded 5to except that of Mandhre's. But Mesers. Kirloshar's, Deddhar's and Kale and Nagarkar's have sown layri much thicker than ordinarily required. As to Jowar Mr. Deedhar's only sow it thicker than required.
  - The Mirajdrill, as it stands, is not suitable for sloping land. Messars. Kale and Nagaskar's will have the same difficulty.
  - b. To judge this your we have selected four kinds of seed, namely, bajir, Jowar, cotton and groundant. But all drills could only deal with lajir and Jowar nearing satisfaction. Joshi of Jamkhindir, Miraj and Kale and Nagarkar's were able to sow cotton seed but not at all to any estisfaction. The first two of these were able to pass groundant seed through their hoppers lut the dropping was so irregular that it is not worth considering.
  - All the competitors had sent in full sized working models
    hat that of Joshi of Amraoti was too delicate to stand
    the field trial.
- 5. A short note giving the obvious ments and defects of each drill separately is given below:-

Mostly of cast iron parts, hence not repairable in a village; the springs pulling down the piston under the supplier of the piston of the supplier of the supp

Easy for transport and setting deep or shallow; distance between seed to seed adjustable.

The parts of automatic mechanism not sufficiently strong. Not easy for transport.

Being mostly made of wooden parts and requiring no chain, easily

2 Mr. Joshi, Jamkhuad reparanie in n village. Distance between seed to seed adjustible. Also adjustible for size of seed. Contents of hopper easily removed. Seed rate of the same kind of seed adjustible.

No provision to change the distance between seed to seed and for different sixes. This is only possible by Nagarkar.

Alesara, Kale and changing the oplinders for a different distance or sixe. The arrangement for mixed sowing provided is defective emptyfag the cylinder difficult. Unsuitable for sloping land difficult for transport.

Simple in mechanism. Easily reparable by a village carpenter and a tinman.

Hoppers leaky. Not easy for transport. No arrangement to throw ont of work. Difficult to clean the hopper. No provision to change the distance between seed to seed and for different sized seed.

Simpler in construction and being made of wooden parts excepting the two sproket wheels and chain, is reparable in a village.

Driving chain gets ont of order. Seeds crushed, by the pressure 5. Mr. Harjivan, Carrispenter, Surst.

The hoppers not having sufficient slope towards the hole, cotton seeds could not be led into the bole. Difficult to transport. No provision to change the distance between seed to seed. Adjustible to different sizes of seeds. Rather simple,

Sowing urregular. The adjustment for cotton and groundant not

6. Mr Mandhre, Loni effective Emptying the hopper difficult. The arrangement for throwing out of work impractical. Was received over time. Seed rate adjustible. Easy for excepting two gear wheels can be repaired in towns and cities. Durable.

Hopler nrrangement defective. Requiring the seed to be kept at nlmost a constant level, and for this reason some lines remain unsown on

7 Ganesh Kalagriha, sloppy ground. No provision for changing the distance between seed to seed and for difficult. Not easy for transport.

Simple and compact. Durable parts of automatic mechanism but if broken cannot be repaired in a village.

Coald not be worked owing to delicate mechanism. Seems to have possibilities.

6. We have put each drill to a careful, thorough and critical test with the exception of No. 8 above, the automatic mechanism of which was too delicate to permit its working on a field scale. All the rest were subjected to a field sowing.

To nerive at an necessate comparison of the several drille we made a list of all the requisite points that should be in an ideal drill under two heads mayor and mnor. The capability of each drill as observed from a careful examination of the various mechanism, independently and in consultation with the makers and further tested by field trials, for each point, has been marked. The statement giving these details is uiven below —

Considering on the whole, there is not a single drill which reaches even approximately the required standard of completeness. In assigning marks therefore to each drill we have taken into consideration to how many points, the maker has given thought and to what extent his ideas are put into practice.

							_	_	
Points considered.	Fuli Marks.	- Kirloskar.	Joshi of	Kale and to Nagarkar	Deodhar,	o Haryivan.	Mandhre.	Ganesh Kala Griha.	Amreoti.
Hojor.  1. Principle of automatism.  2. Regulation of distance between seed to seed in a row  3. Uniform dropping  3. Uniform dropping  5. Regulation of depth  6. Maximum and minimum pumber of seeds in a place  7. Regulation of seeds in a place  Total Mejor  Total Mejor	100 100 100 75 50 50 50	50 100 50 20 40 10 30	50 100 85 50 15 33 25	25 85 20 10 30 10	50 25 70 20 10 25 10	35 25 65 60 15 35 25	55 60 55 40 35 30 20	50 35 85 40 15 30 10	75 25 20 10 10
1010( m-ju.m.				<del> </del>	-	-	_		-
Minor  1. Simplicity  2. Durability  3. Arrangement to throw out of work  4. Facility for transport  5. Regulation of destare  6. Minimum quantity of seed that can be sown  7. Arrangement for empty ing the hopper  8. Arrangement to sow mixtures.  10. Working arrangement.  11. Covering arrangement.  12. Arrangement to see whether the seed in dropping  13. 27	25 20 15 15 15 15 10 10 10	5 20 20 15 15 15 15 3 10 10 10	15 10 15 0 0 15 12 0 10 0 0 0	157 0 0 10 1 0 5 0 0 0	15 10 0 0 15 3 0 0 0	10 10 8 0 5 15 3 0 10 10 0	10 17 5 15 10 15 5 0 10 0	18 12 0 5 0 0 2 0 3 10 10 0	15 5 0 10 0 15 8 0 10 0 0 0 0
Total Minor	175	133	77	33	53	71	87	60	63
Grand Total	700	433	437	278	263	331	382	325	203

7. From the statement it will be seen that we have allotted in all 700 marks out of which 525 are for major points, and 175 for minor. The various drills stand in the following order of merit:—

Rank and Name of the Competitor.	Major.	Minor.	Total.
I (2) Mr. Joshi of Jamkhindi II (1) Messre Kirloskar Bros III (6) Mr. Mandhre, Loni IV (5) Mr. Harjvan, Start livry V (7) Ganesh Kala Griba, Birry VI (3) Messra Kale and Nagarkar VII (4) Mr. Deoldar, Baramati VIII (5) Mr. Joshi, Amraoti	360 300 295 260 265 240 210	77 133 87 71 60 38 53 63	437 433 382 331 325 278 263 203

<sup>\*</sup> Certain points of these could not be tested in the field owing to unworkable mechanism.

Note:—In the above marking we have not made any disallowance for Mr. Mandbre's drill for submitting it much later than the last prescribed date. Further we understand that he was allowed to see the other competition drills before submission of his model.

On a careful consideration, we have come to a conclusion that no one drill is en superior to others as to carry away the full araunut of the prize, in exclusion of others

Each and every one has shown some ingenious originality and deserves appreciation. We therefore recommend that the purse he distributed. We might propose, for this purpose, that all the first seven receive Rs. 40 each, and the remaining Rs. 220 be distributed amongst the first five according to their order of ment in the scale pre-cribed in the following table:—

Rank	and Name of the Competitor.	General.	Special.	Total.
VIII VII VII VII VII VII VII VII VIII VIII	Mr. Joshi, Jamkhiodi Messrs. Kirlosksr Brothers Mr. Mandhre, Loni Mr. Harjivan, Sorat Ganesh Kala Griba, Miraj Messrs. Kale and Negarkar Mr. Deothar, Beramati Mr. Joshi, Amraoti Total	40 40 40	00 05 40 15 10 	130 105 80 55 50 40 40 

Considering all the points, none of the drills as presented in the model is in a suitable form for immediate adoption, as they stand. This much is certain, however, that very good ideas have been brought forward, and from a combination of the good points of each it is possible to work out each of the principles represented to an efficiency required for our condutions.

### Seed Drill Presented by

#### Messes Kirloskar Bros,

Kirloskar Wadi, Dist. Salaro.

This is a four contrevel drill made entirely of iron parts except the pole. This consists in two edle wheels 14 inches in diameter joined by an axle.

Behind this arise and running parallel to it is a round iron har joined to the former by ellow at both the ends. To the front portion of this elbow is holted a counterpose weight and to the rear the wheel scrapers.

The rear bar carries the coulters; to the rear end of these coulters is holted the automatic sowing attachment and the hopper.

On the same har are fitted two cast iron supports, for holting the draft poles. The invoke edge of this casting has four anothes, which receive the tooth of the levers. The angle of the coulters can be made more or less acute than allowing deep or shallow setting or even throwing them off the ground allogather when required. These levers are fixed to the handles which are placed in-ile and just close to the notched casting.

The automatic sowing apparatus consists of two supports starting from the rear end of the confter and slanting forward and upwards. The rear end of these supports carries a tongue on the underside, of which there is a small roller nightly connected to it but having free movement on its axis.

At the top of the supports is a case which is pierced through by a pointed piston and which has a grooved receiver at the top. On the axle of the wheels, for each coulter is provided a set of toothed wheels, the teeth on different wheels in each set varying from 3 to 8. Any of these can be fixed rigidly to the axic just below the tongue which is pushed apwards, whenever one of the teeth comes exactly below the roller of the tongue, in the process of revolution.

The piston which has been referred to above, normally rests on the tongue and is pushed upwards by the upward movement of the latter. The piston when once lifted, is brought down by a spring if not so done by its own weight.

The piston when pushed protrates in the groove referred to above and lifts up and delivers into the tubes, the seeds which have run down in the groove from the hopper.

The distance between the rows is adjustable by movable coulters. Arrangement for mixed sowing is provided.

The machine is of cast iron and strong but heavy. It is easy to transport

This drill carries an attachment for covering the seed after sowing.

### Seed Delli Presented by

### Mr. Joshi, Jamkhindi.

This consists of an ordinary three conferred seed-drill usually used for sowing Jowar in that tract, and an automatic sowing mechanism as described below.—

The horizontal motion of the bollocks while walking is transmitted in crudar motion by merus of one central wooden wheel 12 inches in duameter, and rolling on the ground. It is fixed to the draft pole by means of two non-standards working on a hinge with the draft pole. On one end of the axle of this wheel there is another wooden pulley of 2" duameter.

Over the tutes is erected a platform which is supported by two upmore each the, is fixed a small rectangular wooden case. Through
the centre of these passes a squire shaft. Three wooden pulleys of
4", 6", and 8" drimeters are fixed on this shaft close to the central
case. A rope passes over the small pulley and one of these according
is the distance between two seeds in a row is required. This rope also
passes over a third pulley which is fixed in two perpendicular iron
supports there feet over the transmission, wheel,

In each of the three wooden cases a wooden roller one inch in diameter and 11 inches long and having two circles of 12 depressions, each of which on one alternates with one on the other.

Regulation of the seed-rate:—This is effected by a wooden pin passing through the side of such case and can be publed in just above the roller. More the length of the roller exposed to the flow of the seed from the hopper, more seed or bigger size will be sown. The pin by pashing out or in can be made to cover more or less length of the roller.

In front of the cases there is a screw which presses on a spring inside the case and can widen or narrow down the opening over the roller, thins allowing the feeding of bigger or smaller sized seeds. The machine can be thrown out of work when desired by hiting the transmission wheel off the ground by means of ropes.

Regulation of distance between two adjacent seeds in a row:—This can be done by shifting the rape on one of the three wooden wheels, or covering or keeping open both the series of holes on the inside roller.

The contrivance has been put into practice in a very simple and ingenious manner and consists of parts which are easily procurable and repairable. The construction as made is however kache and rickety.

### Seed Drlll Presented by

### Messrs. Kale and Nagarkar,

Agricultural College, Poona.

This consists in the following intomatic sowing arrangement attached to an ordinary local four confered drill.

To the head piece are nailed two iron strips, one at each end, and projecting forward. The forward ends are curved into a loop through which passes an axle, carrying two woolen wheels 16" in diameter one at each end.

This nxle passes through a galvanusel non sheet cylinder 5" in diameter and carries a fan of the same material, which revolves inside and flash to the sides of the cylinder. The cylinder has 4 circles of equidistant holes, the distance between each two circles being the same as the distance between each two articles being the same as the distance between each two articles being the same as the distance

between the two conlters. (The c) Inder has a compartment for sowing a mixed crop like tar.) But this will not do the mixed cropping as required in practice.

By the walking of the ballocks the wheels turn on the ground and those the arte, as well as the fan and the cylinker on it. When each hole on the cylinder, comes at the lowest position it drops through it the seeds from the cylinker. The seeds are then canght by funnels placed just below the cylinker and are carried by short tubes through the coulters into the ground.

### Seed Drill Presented by

### Mr. Deodhar, Baramati,

#### Dist. Poora.

This consists in the following automatic sowing arrangement attached to an ordinary four contered seed-drill.

At the two ends of the head piece are mortised two cross wooden pieces projecting about 15" forward from the head piece; through these, 8 inches in front of the head piece passes a round iron and carrying at both the ends outside the pieces two wooden wheels 18" in diameter and protected hy iron tyres. These wheels, when the drill is at work roll on the ground.

The two end pieces above referred to also carry two vertical supports 2 fall. Inside the top of these supports is bibled on a deal wood hox divided into four compartments wide at the top so sloping inwards at the bottom as to leave a narrow left in the bottom. Each slit comes over the bandou these fifted vertically in the coulters.

There is another axle with its ends inserted in the vertical supports just helow the box. This axle carnes four wooden disks having on its circumference nine equivilentant pixs. These disks are so fixed that they will revolve in the slit at the bottom of each compartment. The portion of disks exposed below the low is encased by a tin case opening below into the hamboo these.

Each of the two axles described above carries in its respective centre a gear wheel of the same size over which passes a chain. When the drill is in motion the land wheels then round and thus make the sowing disks to revolve which in their process of revolution pick up seeds from the hopper and feed them at regular intervals into the tubes.

### Seed-Drill Presented by

### Mr. Harjiwan, Carpenter,

Surat.

This consists of a rectangular wooden frame below the back end of which are fixed coulters like an ordinary drill l'apart.

The automatic mechanism consists of the following :-

The frame is mounted on the axle of two wooden side wheels 18" in diameter. This axle carnes between the left wheel and frame a cycle gearing. The frame carries a seed box on two supports 21" tall containing four compartments. On the top of the two supports and inside the seed box is placed a square shaft which carnes outside the case on the left end one small gearing.

A chain passes over this small wheel and the one mentioned above. Thus a revolving motion is created by the landwheels and transmitted to the shuft inside the box.

The square shaft passes through four wooden wheels one in each compartment and brying 6 wooden teeth on each. The centre of each compartment has a hole at the bottom which is kept closed by a button connected to a spring and which is opened by a pash of the teeth on to the spring in the process of revolution.

The seeds dropped though these holes are received by a fannel into iron tubes which carry it into the soil through the coulters as in an ordinary drill.

Regulation of di-tance between seed to seed in a row:—adjusted by putting in tin plates having different sized holes according to the size or grain or seed-rate to be sown under the central hole in each compartment.

While at work seeds were being crushed nuder the button at each stroke.

### The Coultered Seed-Dr. U.

The construction and the sowing arrangement are the same as in the four conferred drill, except that there is provision for giving three distances between the two adjacent rows.

#### Seed Delli Presented by

### Mr. Martandrao Mandhre, Loni,

#### District Poona.

This Four Coultered drill, which is wholly made of iron consists of an angle iron frame mounted on the axle of two side wheels 12 juckes in diameter and a third wheel in front. On the left end of the axle of the two side wheels and outside the wheel on that side is fixed a small heyele gear wheel.

On the main frame, just over the axle, are revetted double npright supports 20 inches tall. To the top of these supports is holted a Sheetiran hav.

About 4 inches below this box, is a square but inserted and turning ato bearings in the upright supports. To the left end of this is fitted a bigger gear wheel being the mate to the cogwheel at one end of the axle of the sule wheels mentioned above. A bicycle chain passes over these two, and transmits the motion of the side wheels to the apper avie.

The apper bar passes through four wooden rollers 3" diameter, have any on their curcumference two circles of groves and two circles of equadistant pits. These rollers are encased in closely fitting rom cylind ens, each of which hasone hole at the bottum and another hole at the top the latter being connected with the seed in the bot by a funnel. The iron cylinder has also a hole at the linch which is always shirt by a button kept pressed on it by a spring, but which can be opened when required.

Petween the two lower ends of the apright supports is carried another iron bar on which are holted four wrought iron coulters in two pieces hinged together. This bar has a series of boles so that the coulters can be fixed at varying distances. The forward portion of the coulter has a long hook which can be latched behind and made to raise the coulters off from the ground when necessary. The rear half of the coulter has also holes, which enable them being set on the bar forward or behind so as to make their penetration sallow or deep.

In the boles bored in the front half of the coulters are set iron tabes slanting bebind and resting on a cross bar fixed about the middle of the apright supports. These tabes carry on their top funnels which receive and feed into the tabes the seed as it falls from the cylinder, The bottom of the box has 1' squire holes one over each of the cylinders. On these holes slides an iron strip having four square holes of the same size and at the same distance as those in the bottom of the hox. The feeding area can be regulated or altogether closed by sliding this strip in or out.

The rollers can be drawn in or out so as to bring the desired groove or the line of pits under the feeding. Inde a required by the size of the seed and either billing or drilling. The hole at the back of the cylinder onables examining whether the desired groove or line of pits has been set exactly under the feeding hole.

To the rear end of the frame are fixed two hundles to guide and steady the implement.

This machine is strong, durable and light and very easy to transport.

### Seed-Drill Presented by

### Ganesh Kala Griba, Miraj

This is a three coultered drill with the following antomatic arrangement:-

On the head piece of the drill two supports 15' tall are erected which carry on their top a board on which is holted on a hopper. The hopper is pieced through the sides by an iron at le which carries, inside the hopper, three cast iron growed pulleys. On one end of the axle ontsade the hopper is fixed a gear wheel. From both ends of the same axle also ontside the hopper are hung two iron strips, which at the lower ends are pieced through hy another axle carrying a wooden roller 8" in diameter and 64 inches wide and a gear wheel on one side and of the same size as the one mentioned above.

Over the two gears—one on the sale of the roller and the other on the side of the hopper-passes a chain.

The wooden roller when at work rolls on the ground and thus make the grooved pulleys inside the hopper to revolve. The hopper has three holes in its bottom through which rase three sheet-iron their in front of the pulleys. The pulleys have on their circumference four quilistant pits, which, when the drill sat work, revolve, pick up the seeds from the hopper and feed the thuse in front, regularly.

#### Seed-Drill Presented by

### Mr. P R. Joshi, Amraoti.

This consists in an ordinary three conferred drill baying the coulters I foot apart, with an automatic sowing arrangement as described below.

A wheel I foot in drameter is fixed on the underside of the draft, pole 2 feet forward from the head piece of the drill. The vertical motion of this wheel is charged into horizontally semi-circular motion by an eccentric arrangement, which moves in a hopper, a circular from plate, having 13 boles

The bottom of the hopper has got three equidistant holes below each of which there is a sheet-iron tuling which connects with the hambon tribes.

In the process of movement, when the holes of the two plates correspond the seeds drop down and enter the tubes through which they fall into the soil as usual.

Model submitted drops seed every three nuches in the row.

The draft pole is cut into two and joined again by a binge so that he height of the hullocks and distance of joking may not lift the wheel toff from the ground

The principle on which this drill is derived, appears very good, and worth working out but the parts used in the Model are very weak and i could never be worked satisfactorily.

# Tests of Foreign Seed-Drills

ox

#### The Agricuttural College Farm

EΥ

#### V G. Gokhale, In Ag.,

Superintendent Agricultural College Parm.

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During the seaton of tule a considerable number of seed-drills from the contries and manufactures have been collected in the agricultural college farm, and texts have consequently been made to ascertin how far these are better than those locally used, and how they compare among themselves. The following report, prepared by Mr. Gokhalo on the subject, and submitted to professor Kinght, will be found of great interest. Ed. ]

The following 7 drills were tried .-

- 1. Rudsack Disk Drill.
- 2. Rudsack Coulter Drill.
- 3. Keystone Disk Drill.
- 4. Chpper 5 Hoed Drill.
- 5. Climax Com planter single row.
- Single row corn planter having three series of feeth on driving wheel, and,
  - 7. Poous local Kharif drill for comparison.

All these were worked on 22nd August 1912 when the land was accessible, and had sufficient mousture. The soil was prepared into a very good seed led.

I enclose herewith a statement, embodying the results of tests taken with the various drills on the points noted therein.

My experience, and observations of these drills and their working, and my interpretation of the results of tests obtained, as recorded in the statement might be summarised as follows:— Sustability to different sized seeds:—All drills except Nos. 5 and 6 could be made to sow all sizes of grains upto and including maize. The sowing of groundant was not however satisfactory in any, even with the smaller varieties far less with bigger ones.

Nos. 5 and 6 having no adjustment, sowed smaller sized grains like Bajit and Jowars too thick. But it would not be difficult to get the necessary modifications made here. Groundout seed was crushed owing to insufficient depth of the hole in the plate.

Percentage of misses or un-soun land :- In this respect the corn planters are ideal for all grains that can pass through the holes in the plate. The rest have sown the smaller sizes without any material skips. In the case of Keystone and Clipper the percentage has been insignificant as compared to the German drills. But it is believed, that if the German drills might have been set us thick in the row us the above two the percentage would have been reduced to the same. gaps, in the case of higger sized seeds-cotton, maize and groundant,have been many ; but letting a thicker seed rate and keeping a larger quantity of seed in the hopper, would, it is believed, diminish them a good deal. As regards cotton the ordinary pasting with eow dung und mad is not sufficient but it is essential that the seeds must be pasted hard and thoroughly dry, so that they will never clog together ander the revolving pressure of the feeding wheels. Pasting with wheat flour was not found sufficiently effective. This had near to be pasted by n thick paste of sticky-clay.

Atterage distance from seed to seed in a row obtained during regular delivery:—In the case of cora planters the dropping was regular at set distances, but in case of small seed-Bayti and Jowar through a maize hole-many seeds dropping through the hig hole, spread over a distance of 9 to 12 inches at each hill in a line.

For other, at each feeding 2 to 5 seeds or more were fed each time, while either distributed in two or three equidistant places over the entire set distance, or over a continuous line when the seed-rate was thicker.

Adjustibility to carying distances between the adjacent rows:—This is practicable to almost any distance in German drills by shifting the position of the conters and closing the nunceessary feeding wheels. It

is also possible to a considerable degree in the "Clipper". In the single row corn planters, it is perfect as it only sows one row at a time.

Draft: The draft in the bigger drills is about twice as much as in the local one, thus requiring two pairs; that is the Clipper drill is nearly the same as the local drill. The corn-planters were of course tha lightest in draft having sown only one row at a time.

Maximum dopth penetrated:— In this respect the Rudsack confler comes the last, but not so but as it appears, on thoroughly prepared soil. The Clipper is better than Keystone.

Special points of each —The-f'ora planter system of delivery will have no skip and dropping will be perfectly regular. These are adjostable for distance between seed to seed in a row. The machines are simple and handy.

The German drills have provision for a variable distance between seed to seed to a row and the seed can be made to drop from below or above necording to the size, it being always possible to sow the larger sized seeds from above. These are also easy to empty the contents of the hopper.

Clipper drill, considering its simplicity and size have more adjustments, and is cheap and easily drawn by one pair.

Conclusions. — In the first instance it is clearly brought out how defective the local seed dull, is, the percentage of skips, by the best on this farm being 30 and over for all sizes of seeds except jowar when when it ready approximes 20 per cent.

I am of opinion, that Five-hood Chapter drill suits the ladina conditions more than any one else. The adjustment for variable distance between seed to seed as a mw can also be done at a very little extra cost, as I have already succeeded in doing so on the farm drill.

The principle of the Com-planter is of course the most desirable, provided it is combined into a three-rowed one, which I have ideas is not impracticable to make.

	INE Wel	ICULTUR.	AL C	OLLEGE ]	MAGAZIN	E.	
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# The Economic Water Plants of the Bombay Presidency.

BY

#### H. M Chibber, M. A.

( Continued from the July number of 1912. )

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THE water plants treated in the July number of this Journal were such as yielded food for human consumption. Those that I am dealing with in this number yield other products. Before doing so, I would supplement the information regarding the practice of planting Shingada (Trapa bispinosa) followed in this Presidency.

At Dohnd in the Panch Mahal Dastrict, the planter, who is a Bhoi hy caste takes three or four vines by the lower end, and gives them a simple knot there. He thus prepares all the vines to be planted into bunches of three or four. He takes them into water over a finat of any sort (generally a log of wood hollowed out). He stands in the waters that are about three or four feet deep holds a bunch of the vines between the fingers and toe of his foot by the knot and presses it in the mud at the bottom of the tank. If the length of the vines permits it, after two or three days, he presses down into the mid one or two feet of the vines just over the knot in a horizontal position. The distance maintaines hetween the different lumphers is about five feet either maintaines he hetween the different lumphers is about five feet either maintaines.

At Nadad in the Kaira District the above process is modified as below. The lower ends of three or four vines are taken and are secured to a peg of wood by a grass rope. The peg is about a foot in length, pointed at the lower end and provided with a sort of groove near the upper end. The rope is tied to the vines about a foot from the end-The rope is then plaited with the foot-length left for the purpose and to free end is tied to the peg. The planter enters the tank with the bunches held by the pegs. He dives if necessary and drives the pegs into the mud at the buttom of the tank. No further pressing of the vines subsequent to planting is practised. The planting-distance is the same as at Dobad.



POTAMOGETON PERFOLIATUS,

Aeschynomene aspera L.-This is an annual, growing in the rains on the margins of tanks. It grows wild throughout the Presidency. The writer is not aware of its being cultivated anywhere. It is a plant of the Leanmingus order. It is its stem that has no economic value. The lower part about a foot or two in length is swollen with soft pith-like anhatance containing air. To the plant this tissue probably serves the purpose of facilitating respiration of the roots that are submerged under water or wet mad. To men this spongy material is serviceable in a variety of ways. It is used in the manufacture of the sol 1 Tom which is worn by people to protect themselves against the sun. A more artistic production takes the form of Bashing, a kind of wedding crown worn on the marriage day among certain Hindoo castes. I saw some very efficative ones made at Kumta. They were expensive as well, costing about twenty rupees a piece. The pith can also be put to ases extemporised on the snot. I noticed for instance a farmer using it very satisfactorily as a substitute for bottle cork in a village where corks could not be had. It also serves admirably as a float to a fishing hook.

Typha angustata-It is often known as the Bulrash. Other local names are Pan-kanesh, Ap, Gha-pura or Gha-bapri. It grows in marshy places and in tanks. Its leaves being strong and strip like are used for twine by villagers in general, and particularly by pan growers to secure the vines to the supports. A more specific use is made of the cottony stuff (awas) which is formed in the mature ear. The ear in flower is an elongated structure about a foot or more in length divided into two approximately equal sections. The upper one is made up of only male flowers and the lower of only female flowers. After the work of the male flowers is over they wither. The female inflorescence at this stage looks somewhat like a Bajri (Pennisetum typhoideum) ear. Where the seeds are mature they are dispersed by the cottony substance tn which they adhere, flying into the air. Before the dispersal takes place this cotton wool is collected. It is used as a styptic. The writer had occasion to use it himself as such and found it efficaceous. The vernacular name Gha-bajre implies a Bajre which is efficaceous nn wounds. The specific name of Bajri (typhoideum) is on the other hand taken from the generic name of this plant (typha). So both the nomenclatures, vernacular and scientific, establish an association between the twn plants.

Were the cotton wool of Typha obtainable in large quantities it could be used in a variety of ways like the silk cotton of Kapok.

Chameruphis spinescens.—This is a grass with floating habit found in tauks all over the Presidency. It is called Had in North Konkau. After the rains are over the tauks are often fall of floating masses of its thin wiry green stems. This staff is used for grazing, Horses, I am told, are partenlarly found of it. During the rains about the mouth of September the grass is in flower which appear above the water. The tauk surface would then be mistaken for land by the unwary.

Potamogeton perfolatus.—This is n submerged plant with transparent leaves. With other allied forms it fills many of the Rockan and Karnatik tanks with tons of vegetable matter. Like most water plants it is devoid of woody matter, easy to drag out of water, out then easy again to dry in the sun, as the leaves are not provided with any mechanism to resist evaporation, being always submerged under water. These characters make it easy to collect large quantities of the plant and store in the dry state. With n view to know if the abandance could be put to any use, which so far lies neglected, a sun dried sample of it, collected at Haver by me, was sent to Dr. H. H. Mann, D. So., Agrienlarst Chemist to the Government of Bombay, Poona, for analysis and opinion. I quote below from a report which he was good enough to forward to me.

"Chemical analysis of a sun dried epecimen of a common water weed (Potamogeton perfoliatus).

Moisture.	6.01
* A*h.	19-42
Ether extract.	1.80
† Albuminoids.	11.00
Carbobydrates.	49-01
Woody fibre.	12.73
* Containing sand.	3-67
† Containing nutrogen,	1.77
Potash.	2:10
Phosphoric serl.	0.52

<sup>&</sup>quot;As a manure it would be valuable locally, probably considerably better when dry, than cattle manure."

# ખેતી વાડીને લગતા ટુચકા, કહેવતો અને પદ્દો વગેરે.

( લર્ચ જલ્લાના દુવર કેલોગ અઐ ખેતીવાડી ખીલવનાર મંડળ માટે સંશોધન-થી સંગુહ કરી પ્રગટ કરનાર એ મંડળના ઐતરરી સેક્રેટરી ચીચનલાલ હરદેરામ. )

### નીતી અને દ્વમ.

૧. કરમ વતા તર ખેતી કરે ભળદ મરે કે મુકવાવું પડે.

ર. ખેડ ખાતર; ને પાણી નસીવને લાવે તાણી.

a. . લત્તમ ખેતી. મધ્યમ વેષાર, નક્ટ નાકરી, ને નીદાન ભીખ.

વીચ્ચન—મેમ કટ્ટેવામાં આવે છે કે એક વેષારી વધુત્તરા દેશાવર માલ લશી વધુત્તર ક્ષષ્ટ બેલો દૃતા. રસ્તામાં એક કુવાના થાળા આગળ પડેશા પત્યર ઉપર ઉપરે હપેશો દૃદો તૈના વાંચવામાં આવ્યો. તે ઉપરયી તેણે પોતાનો વેષાર તછ ખેતી કરવા માંદી. તેમાં તેને ખેડ ગઇ. વધુત્તરાને લાગ્યું કે આ કહેવન ખેડી છે માટે એ પત્થરને ઉધા નાંખી દેવા કે બીજો કેલા વાંચી પોતાની માધક છેતરાય નદી. પત્યર હશાવાને હતી નાંખવા માંડયા એટલે બીજી બાજીપર નીચેની કદેવત કેત્વેલી માલમ પાડી.

૪. ખેતા ઘણા સેયા, નહીં તા કુજેતા.

વહું નવે: વીસ્મય થઈ વીચાર કરવા લાગ્યો કે મેં તો ઘેર બેરતી ખેતી કરાવી. ખેતર પર જઈ દેખરેખ રાખી નવે મહેતા કરાવી નહીં હતી, તેથી મને નુકશાન ગયું હશે. બીજે વરસે લખ્યી કહેવત પ્રમાણે ખેતી કરી ત્યારે તેને ખાતી થઇ કે " હત્તમ ખેતી" વાળી કરેવત ખરી છે.

प. वांत्रना वृक्षिणा ने संडी संडनी भेती, ने भन्नेनी इन्ती.

મતલજ કે વગર પરણેકા માજુસ દુધ દર્શના વસોષ્ણ કરે અને રાંડી શંડ અી ખેતી કરે એ બન્નેની કુજેતી થાય.

ઘરના ગોધા, ઘરના જેધ્ધા, ઘરની નારી લાવે ભાત.

तेनी साथे धरना साय, ना भाड़े से ते शु वात

સતલળ કે ઘરના વળદ હોય, ઘરના સાગુરો નેઘ્ધા જેવું કામ કરનારા હોય, ઘરની એ ખેતરે ભાત વિગેરે પ્યાચાર્યું લઇને આવનાર હોય, તેની સાથે ઘરના ઇાકરાં ખેતરે આવનાર હોય તેા પછી નહીં કેમ પાકે, પાકેવા વગર રહેજ નહીં

છ. સંપત હાેય ચાેડી તાે રાખીએ ગાય કલાેડી. ( જીવાન વાછરડી )

મતલ મુકે પારી પુંજી ચેડી હોય તો નાની વાહરડી ઘર રાખવી કે તેને ઘરને: ગાંધા થાય.

કાચે ખળદે ખેતી કરે ઉંટપર ચઢીને ઉપે.
 મતલભ કે:—આ પ્રયાણે જે કામ કરે તેને હાની થાય.

અાંબ ફળે પત નીપજે મહુ ફળે પત નાય,
 એતો રસ જે પીએ, તેની અક્કલ મારી નાય.

મતલળ કે:—આંબી ફાંગે ત્યારે તેને પાંતરા પણ વ્યાવે, અને મહુડા ફાંગે. ત્યારે તેના પાંતરા ખરી જાય અને તે નાગા ઉધાડા થઇ જાય છે. તે પ્રમાણે જે માણસ એ મહુડાના રસ પીયે છે તે પણ નાગા ઉધાડા થઇ જાય છે.

૧૦. કહ્યુંબી કસર કરસણે, રજપુત કસર રાેટલે,

વાણીઓ કસર જીધ્ધ ને ભાષડી કસર દુધ.

મતલળ કે:—કહ્યુંથી સારા સાગ છેલ્ડ કદી કોર્સે નહીં, ખેતરતી આહુ બાલુતાં જે તળાય દેશ હોય તે થળદ વગેરેને ખલાવાસાક કોર્સ તેઓની સમજ એવી છે કે ખેતરતી આજુ બાલું જે પાંકે તે પોતાનું અને વચગાલે જે પાંકે તે સરકારનું માટે ખેતરતી આજુ બાલું જે પાંકે તે સરકારનું માટે ખેતરત વચ્ચાનો ભાગ કસર કરી સાચવી રાખે. રુખતુ પોતાને ઘર પેરોણા આવ્યો હોય તે કર્યું મો કહાગ્રીને તેને પાય પહું વેટલામાં કસર કરે. તકરાર થઇ હોય તે માર્યો આપ્યો જોમ કરે નહીં. એ વાનમાં તે કસર કરે, ઘર પોરોણા આવ્યા હોય તો ખેડું- તની સી થી ખાવા આપે પહું દૂધ આપતાં કસર કરે કેમકે દુધ સાચવે તો ફરી થી શાય પરંતું થી અને દૂધની કંમતનો વાયર નહીં કરે.

૧૧. ચાકરતું રળમું ચાકર ખાય, ઘરના ઘણી પશ્યા જાય,

તે જાતે રળે તા કાંઠી ભાગય.

૧૨. પરમાં બાયડી ને ખેતરે બાવડી.

#### વરસાદના વરતારા.

મોતરની વાદગી દખબુ ભય, તો વરસ્યા વના વહાર્યું ન વાય.

 અખાડી શુધ્ધ પંચમાં, જો ત્રભુકે વીજ, કહ્યુ વેચીને ધન કરા, ઢારા ભળદ ને બીજ.

ર. વા વાયા મુરીયા તો ભાત કર્યું પુરીયા.

orque 3:--

ધાઉરી વા વાયા તેા હળ છેાડ ઘર કર્યું નહીં આયા.

મતલભ કે:—એક ખેડત સાંધેડુ લઇ ખેતર ગયો હતા. તેની અંતે ભાત (ખાવાતું) લઇ ઘણીતે ખાવા આપવા અર્ધા. તે વખતે સુરીઓ એટલે તોફાની વા વાતો હતા. ત્યારે પરેટ્રો પહેલું પર હતું. ત્યારે તેની ઓ એ ખીવ, પરંદુ કે ઘણી એટલે ઉત્તર દીશાના વા વાવા માંઢેયો છે અતે તમે સાંધીકુ છોડી ઘર કેમ નદીં આબ્યાં કુમણા વરસાદ આવશે, એટલામાં વરસાદ થયાં અને બન્ને જણા લિભાઇ મ્યા.

૪. જેઠ ખંતર દો દહાડલા, તે આજંતી લહ્યું કુવા કોઠે ક'!ચંડ તે નદી કોઠે લંડ. મતલન કે:—જેઠ મહીનામાં ચૈદદશ, અમારો ગાજ વીજ થાય તો કુવા કોઠે ખા, ખેત્રીઆંમાં પાણી રેખાલ અને તતી કોઠે લીલું થાંસ રેખાય ખીજે દેકાણે પાણી કે લીલુ ધાસ નજવે પડે નહીં. આ ત્રાજ વીજ પડી ભેતેર દહાડે વરસાદ થાય. પ. એ જેઠી બીલ ગાજે તો ખેતેક કાઠે.

દુ. જેઠ રચા, અખાડ મથા શ્રાવસ રેતુ જ, ભાદરવે જગ રેલ ઉ કે છઠે અનુરાધા.

મતલજ કે:—જેઠ, અખાડને શ્રાવણ કૈારા જાય તો પણ ભારવા સુદ છઠે અનુરાધા નક્ષત્ર હોય તેત ભારે રેલ આવે એવા વરસાદ થાય.

છ. ક્તીકા કરેકલ્યાણ, રોકણી કરે સુકાલ, જો વરસે મગસર તાે નિશ્ચે પડેદકાળ.

મતલજ કૈ:—કૃતિકાના વરસાદ સારા, રોહણીના સારા પથુ પ્રગસરમાં પડેલા વરસાદ કરસણને નુકસાન કરે તેને ખાધ લગાડે,

રાહીણી રેળેલી સારી કે દેલેલી સારી પણ દાંગેલી ખાડી.

સતલજ કે:— રાહીણું નક્ષત્રમાં વધારે વરસાદ થાય તે સારા કે બીલકુલ નુ થાય તે ઠીક પરંદ્વ એપ્ડા ચાય તે ખાટા રાહીણું નક્ષત્રમાં જે ઢેકાંણુ વધારે વરસાદ થયા હોય ત્યાં દીવાળી સુધી વધારે વરસાદ થયા કરે અને જ્યાં થોડા થયા હોય ત્યાં યોડા થયા કરે.

હ. આર્ટી ભરે ખાધરા, ખેડુતના દહાડા પાધરા.

૧. આર્ડા કરે ઉલામથ તા મારી આવે મેહ.

૧૧. ૠગસરના ન વાષા વાયત, આર્દીના ન વરસ્યા મેહ; જેઠી પુત્ર ન જગ્યા, તેના રહતાં ન આવે છેદ.

૧૨. વરસે ગીત તા પડે બીત.

મતલ ૧ કેઃ—-રીત્રામાં વરસાદ વ્યાવે તેા એવા થાય કે ભીંત પાકે.

13. જે દીવસે શું વૈર વરસે ત્યાર પછી છા! મહિતે વરસાદ થાય. શું વૈર જેટલા ભેરમાં દોવ તેટલા ભેરમાં વરસાદ થાય શું વૈર આવ્યા પછી આડ દશ દહાડામાં વરસાદ થાય તો ઉપર પ્રમાણે ભેતે નહીં.

૧૪. ટીટાડી માટીની ગેળ પાલ કરી તેની અંદર ચાર ઇઠા મુકે છે, ઉંચાલુ જમીનમાં પાલ કરી ઇઠા પુકલા હોય તો વરસાદ સારા થાય નીથાલું, જમીનમાં પાલ કરી ઇદા મુક્લા હોય તો આંકો થાય.

## વાવેતર કરવાની વેળા વગેરે:--

૧. મુખ તરાત્રમાં બાજરી એક્સી. ૨. મુર્વો તકારમાં તલ એક્સા.

ર, દરત નક્ષત્રમાં જીવાર એક્સપી. ૪. ચિત્રા નક્ષત્રમાં લાંગ એક્સપા. ૧. વિશાખા નશત્રમાં ઘઉં એક્સપા. ૧. તલમાં ત્રીજ નહીં અને ૧૦

પ. વિશાખા નશત્રમાં ધર્લ એારવા ૧. તલમાં ત્રીજી, નહીં અને જીવા ૨માં બીજાં નહીં.

મતલમ કેઃ—રવી પાકની તલ સાથે તુવેર વાવવી પશુ ત્રીજું કંઇ વાવલું નદી. જુવાર એકલી વાવવી તેમાં બીજી કંઈ વાવલું નહીં,

તલ વલા ને કેદર જાડા, મે દેક ઢેંકે જાર;
 કદમે કદમે કપાસીઓ, સઉવી પાટે જાડ.

મતલય કે:— તલ વેંત વેંત છેટ વલવાવવા, કાદશ જાડા વાવવા, આછા વાવવા નહીં દેડકા એક ઠેકા મારે એટલે છેટે જુવારે વાવવી. કપાસીઓ કદમ કદમને અંતરે વાવવા.

# पाइना तथा सारा **भांधं वरस**ना वरताराः---

૧. ખાખરે ખરસાળી, કં**થારે કાદરા, ને આમલીએ મગ તનર.** મતલખ કેઃ—જે વરસે <mark>ખાખર સારી પાછા હોય તે વરસે ખરસાળા એટલે</mark> ત્રાંગર આદી પાકે. જે વરસે કંથારી સારી થઈ ઢોય તે વરસે જાદરા સારા પાકે જે વરસે

હાંગર, સારી પાકે, જે વરસે કંચારી સારી થઈ હોય તે વરસે કોદરા સારા પાકે, જે વરસે આમલી સારી પાકી હોય તે વરસે મગ અને જીવાર સારા પાકે. 2. પહે લાંગા કાથથી, જે આથમતે સર બહલી વાડય એમ બણા કે દર્ષે

ર. પુત તેણા મચ્યા, જ આવમતે સુર ભડલા વાંક્ય અમે જાણે કે દુધ જમાડું કુર.

મતલળ કે:-સર્ય આયમતી વખતે પૂર્વ દોશામાં ધતુપ થાય તેા ડાંગર સારી પાકે. રૂ. પાકે લીંડા જેવા. યાય કપાસ તેવા.

મૃતલળ જેઃ—બીંડા સારા પાક્યા હોય તા કપાસ સારો પાકે બીંડામાં જેવે ગુગાર થયા દાવ તેવા બગાડ કપાસમાં થાય.

v. વારીલવાળા વાસી નહી રહે.

મતલભ કે:—નભળું વરસ હોય તાે પણ વાસેલ જમાનમાં પાક થાય.

પ. પુષ્પતે, પુલા, આરલેવાની આંદળ મધાને ભારા એ ત્રણ બરાવર. મૃતલબ કે:— પુષ્પ નસમમાં વાવેલી ભાજરીના એક પ્રળામાં જેટલા દાણા

સારાવળ કર— યુખ તાલુખના ધાંત્રના ખાતરા તારારાના એક બાધમાં જેટલા સામુલ પાંકે તેટલા કાણું આરસેવામાં વાર્વેલી ભજરીના પુળા એક બાધમાં જેટલા સામુલ તેમાંથી પાકે અને એક ભારામાં જેટલા પુળા સમાવ તેમાંથી મધામાં વાવેલી બાજરીના કાણા આરક્ષેયાતા પાકની બગળર થાય.

. આરક્ષેયા ને ધઉની ખેતી મસળી ખા**.** 

છ. આરસેષા ભાગે ને મધા વારે.

ત્રતલળ કે:—આરહેષાના વરસાદથી કપાસ ખગડયા હોય તે મધાનું વરસાદથી સુધરે. આસલેષાના વરસાદથી કપાસના છેાડ પાણીમાં કુબે તે ભગડે અને મધાના વરસાદથી પાણીમાં કુબે તો પણ ખગડે નહીં.

૮. હતરા નક્ષત્રમાં વરસાદ વરસ્યા હોય તા ઘઉં સારા થાય.

૯. વરસે ઓતર તા પાક ગાવર

મતલભ કે:—ઉતરા નક્ષત્રમાં વરસાદ થાય તે! ગાતર ઠીક પાકે.

૧૦. વરસે હસ્ત તાે પાકે અરાડે વસ,

૧૧. વરસે ચિત્રા તો ધાન ન ખાય કુત્રા.

મતલભ કે:—ચિત્રામાં વરસાદ થાય તા ધા એટલું થાય કે કુત્રા ખાય નહીં

૧૨. વરસે ચિત્રા ને સાંતને માથે પડે.

મૃતલભ કે:--ચિત્રામાં વરસાદ થાય. તેા શ્વાતમાં પણ વરસાદ થાય. ચિત્રાતા વરસાદ કપાસને સારા નહીં. પર'દ્વ પણકીધી શ્વાતિના વરસાદ થયા એટલે તેનું નામ ભદનામ થાય. એટલે ર સ્વાતિના વરસાદધી કપાસ થયા નહીં.

૧૩. વરસે સાંત તાે ન વાગે તાંત.

મતલળ કે:--સ્વાતિમાં વરસાદ કપાસને સારા નહીં.

૧૪. દીવાળી પછી સંક્રોત રા. રા મહીને આવે તો વરશ સારં. સા મહીને આવે તા વરસ નખળું એમ કહેવામાં આવે છે.

- ૧૫, દ્વાળી સૌચી તેનાપર ધન્ન ગઢાવે છે. તે ધન્ન પુર્વ દીશા તરફ ઉડે તો વરસ સાર્ક ધાન ઉદ્ય ભય તો વરસ મધ્ય અને હોળીમાં પડે તો. નગળું
- અખાત્રીજને દહાડે સુર્ધ અસ્ત થતી વખતે માટીનાં ઘડાળા કાંઠા ત્રણ સેવા અડધા અડધા વાસને અંતરે ત્રહ્યુ કાંદા પુર્વ પશ્ચિમ શીધી લીટીમાં દાટવા. ર જેથી આયમતા સર્થના કોરણ સીધા ત્રણે કાંદામાં ગઇને પસાર યાય. સુર્ય અપરસ થયા પછી ત્રીજના ચંદ્ર 6એ તે વખતે ત્રણ કહા પૈકી પશ્ચિમ તરફનો પડેલા કાંઠે ઈચકવા. તે જગ્યા આગલ લાકડી દાઢવી કે બીજી કું મિશાન કરવું. તે કહિ ચંદ્રની સામુ શટવા, કે જેથી આયમના ચંદ્ર ના કીરણ તેમાંથી પસાર થાય વચલો કહિ પણ ઉચલી પહેલાની સીધી માં આવ્યું માર્ચ માર્ચ કર્યા તરફતા પહેલા કહિ સફળ એવા ફેરવવા લાદીમાં લાટવા. પછા પૂર્વ દોશા તરફતા પહેલા કહિ કહિ એવા ફેરવવા કે ત્રણ કાંદ્રામાંથી મંદ્રના કોરણ સીધા પસાર થાય સુર્ધત વખતે પશ્ચિમ ે ત્વું કહ્યા કહિ દારેલો હતા અને તેને સંદ ઉચ્ચા તે વખતે દ્વાપા રોક ત્યાં આગળ તિશાન કર્યું હતું અને ચંદ્રની સાધુ તેને દારવા હતા ના ત્યા આવા કર્યું છે. તેર પગલાથી ભરેલું. જેટલાં પગલાં અંતર તે એ જગ્યાની વચ્ચેર્યું અંતર પગલાથી ભરેલું. જેટલાં પગલાં અંતર याय तहसा तासा ( हमेश्व तास ) व्यनाल ते वरसे वियाश ज्यम इदेवामां

૧૭ અખાત્રીજ ને દહાંડે ખર્સી કરી જીવા ખેડુતા નીચે મુજબ વરતારા કરે છે. ગામને પાદરે સુર્ય અરત થતી વખતે ગામના કેટલાક લાક એક્કા થાય છે. એક વામ ગાગ, ગુરુ પુત્ર - ગામ માટે કરે છે. તે લીપી ગુપી સાધ કરે છે. વચમાં કાળી લાંગી પહેલી સપાડ જગ્યા પસંદ કરે છે. તે લીપી ગુપી સાધ કરે છે. વાલા પહારો કર્યા છે. તે ટેક્શિય કોરો પંચ પાણી ભરી મુકે છે. ચાર ટેક્શિય નામ માટીના ચાર ટેક્શે મુકે છે. તે ટેક્શિય કોરો પંચ પાણી ભરી મુકે છે. રુદ્દ, અખાડ, શ્રાવધુ અને લાદરવા એ પ્રમાણ પાડે છે. ઘડા ઉપર રાટલા સુકે છે. પછી બધા ચોરેક છેટે ખસી જાય છે. અને કુતરાને રાહ્લો લેવા જવાદે છે. કુતરા પણ ગયા મારુ છે હ ખતા હતું છે. રાટલા લઇને ગામ તરફ જાય તો વરસ સારું નીવડશે એમ માતે છે અને સીમ તરફ જાય તો નગુળું નીવડશે એમ કહે છે. પછી લાણી હાય દેહ હાય દુર દરેક વાવેતર જણ સતા એક એક શુકી ઘડાને કરની સુકે છે. અને બધા ઘેર જાય છે. બીજે દાવસે જ્યું સવા અક અક છુકા વસવ રૂપા છું છે. ગુણ ગુણ વર ગાય છે. તાળ દાવલ સવારે સુર્ય ઉગતા ત્યાં આવી જે સુડીના દાણું વેરાયલા માલમ પડે તે જણસનો પાક સુરા શરો અને જેના દાણું વેરાયલા નવી હોય તેના પાક સારા તહીં શાય એમ કહે સત વહ -ગત જેવા હાલું વતાઓ ગય છે. તેના વાદ સારા તથા લાવ જાત કહે છે. તથા ધડા નીચેતું જે દેપુ વધારે ભીતાલું તે દેશનાં નામવાળા મહીનામાં વધારે રુ, તત્વ પાંચ પાંચ કર્યું જે પ્રમાણમાં ભીતાં થયાં હોય તે પ્રમાણમાં તે દેશાંતા નામ વરસાદ તથા બાધીના દેશાં જે પ્રમાણમાં ભીતાં થયાં હોય તે પ્રમાણમાં તે દેશાંતા નામ વાળા મહીતામાં વરસાદ આવશે એમ ધારે છે.

# Agricultural Sayings

BY

# Mr. Chimanial Harderam,

Honorary Secretary, Industrial and Agricultural Association, Broach District.

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# I. General.

- An agriculturist (under Indian conditions) is at the mercy of Fate, siace, disease might carry away his bullocks and drought might dry up his crops.
  - 2. Wouldst thon command Fate, cultivate, manure, and irrigate.
- 3. Of occupations the noblest is agriculture, next staads commerce, lower still servitude, and lowest of all alms-taking.
- 4. Land without landlord on the spot is a runous position (Cf. The Master's foot manures the land).
- A bachelor acting the dairy maid, a widow acting the husbandnan, is conting failure.
  - 0. One's own bullocks, one's own labour, one's own wife to cook one's food, one's own children to keep one company, precludes one's doubt of success in farming.
  - 7. If you cannot hay your hallocks, breed your hallocks; or, if you are poor, keep a heifer.
  - 8. As foolish it is to yoke bullocks before their age, as to sleep over a camel's back.
  - 9. A mango in bloom is clothed with leaves, but a mhowra in bloom is bare of leaves; so mbowra drink (liquor) will make the drunkard destitute like itself.
  - 10. A cultivator is charry of his ears of corn, and his wife of the supply of milk; (since she wants to keep it for hatter-making).
  - 11. An absentee's estate enriches the servants, while it just Leeps the master going.
  - 12. No boase without a mistress of the house; no firm without a well on the firm.

#### II. Forecasting.

- If you observe lightening on the Ashid shud, 6th, sell your store of grain and huy hullocks and seed (as it forehodes a prosperous year).
- If northern clouds steer southwards it is some to rain overnight.
- When Surya blows expect a storm when Ghauri blows expect a shower.
- 4 If you notice lightening on the last couple of days in the month of Jeshta don't expect rains within seventy-two days.
- If Anuridha Nakahatra falls on the 6th day of Baddarva (the last month of the monsoon) heavy rains will conclude the monsoon no matter how dry it was heretofore.
- Rains in Kritiska Nakshatra or Rohigi Nakshatra are welcome but they forebode fumme if in Mrigasar.
- In Robini Nakshatra it should rain freely or hold over, but not druzle, in order to prove it a prosperior year.
  - 8. Bappy are the cultivators if it rains in Anadra Nakshatra.
- 9. There is no end to calamity if the winds did not blow in Mingasar Nakshatra, or if it did not rain in Anidra Nakshatra or if a son was not born in the month of Jeshia.
- If it runs in Chitra Nakshatra houses would come down tumbling under its force.
- 11. Predict a rainy day just seven months and a half ahead by observing the date of excessive due.
- 12. Expect good runs of a peewst's nest is found on a high ground, and the terso.

#### III. Soung Time.

- Sow Bayn in Pashya Nakshatra; gingelly in Parva N., Jowan in Haste, chickling-vetch (Lathyrus sativus) in Chitrá, and wheat in Vishákhá.
- Gingelly has only one companion (e.s. tur or pigeon pes ),
   Jowari none whatever; (this relates to mixed cultivation).

#### IV. Miscellaneous.

 Sow gingelly loose, and kodra thick; Jowari distance is equal to a frog's leap, cotton to a step.

- If Khákhar (Butia frondosa) flourishes rice will prove a good crop; if Kanthár (capparis sepiaria) is good Kedra (Paspalma scrobiculatum) is good; if tamarind yields in abundence, Meg (Phaseolus Mungo) and Jár (Andropogom Sorghum) too will do so.
- 3. The rain-bow in the east at sunset feretells a humper crop of rice.
- As is the lady's finger, so is the cotten crop ( since these two
  crops have common pests ).
  - 5. Prosperity after fallow.
- Pushya-Nakshatra-rains yield most, Aslesha less, and Maghá least of all. (This refers to Buyri crop).
  - 7. Aslesha Nakshatra rajus and wheat flourishes.
- Aslesha hrands and Magha heats. (This refers to cotton crop.)
   Cotton gains by Magha rams and saffers through raise in Aslesha.
  - 9. Uttara rains are best for wheat.
- Uttara rains favour outer husks; (the glumes are best developed under Uttara rains).
  - 11. Hasta rains are good for all crops.
  - 12. Chitra rains yield a superabundance of rice.
- 13. The fault of Chitra is transferred to Swati (Rains in Chitra are injurious to cotton, while the same in Swati ero not so much, yet people find fault with Swati rains more when they don't get a good crop).
  - 14. Swati rains are not good for cotton.
  - If the sun enters capricorns nine weeks after Divali it will be a good year, if ten weeks after, a bad year.

Note regarding the maning of Naksbutra. The zodiac is divided into twenty-eight subequal divisions; each sub-division is styled a Naksbutra. Indian catendars always denote the position of the eun with regard to these Naksbutras.

### Rinderpest and Protective Inoculation

BY

#### Mr. S. N. Nadgir, B. R. v. C.

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Jar HIS highly contagious disease is not only more serious than almost any other sconrge of cattle but is also of more frequent occurrence than almost any other. It is supposed that it took its origin in the steppes of Western Asia and India from which it has at different times spread to Enrope or other countries with the march of armies or by the extension of commerce. In India it has existed for bundreds of years and is now thoroughly enzootic and consequently a certain degree of immunity has been gradually acquired and morality is comparatively low. Moreover, by a process of weeding out, indigenous cattle have developed a high degree of hereditary resistance which is not however absolute and a certain number of susceptible animals keep up the infection. As it is generally observed the disease occurs seriously only at intervals in one place, after a serious attack it generally dies out in a province, district or village for ceveral years until susceptible animals increase in number when an onthreak occurs. The first put. break is virulent and destructive in its nature and us such baffles all remedies botherto discovered. Within recent years in South Africa it swept a country from end to end and caused autold damages to cattle. In certain parts cultivation of land had to be stopped till a fresh lot of cattle were imported from ont-side. All that could be done therefore to eradicate or suppress the virulence of the disease is to adopt special preventive measures before and nfter it has been prevalent. The common saying 'Prevention is better than cure' applies in this case, only here prevention is the only method. Core is usually impossible.

Before dealing with the advantages of protective inocolation it is interpolated to note that some of the mortality supposed to he due to this deadly plaque is said frequently to be due to the netarious practice of mahars of poisoning the cattle. The growing demand for leather and its consequent high price give n great temptation to such practices, and it is said that cattle poisoning is frequently practised in villages where diseases of a contagious and highly fatal nature exist, for then the eattle owners do not suspect the true reason for the Lath of this carried. so the detection of the crime is readered difficult. How far this is actually done is more a matter of suspicion than of proof. It is even said that occasionally those who will profit by the death of cattle go so fur as to sow the germs of some of the most fatal of the discusses such as Rinderpest and Anthrax hroutcast by removing the garbage of the plague-stricken animals to different villages where they scatter it over sweet bits of pastures.

The cause of rinderpest is not yet discovered. The blood, secretions and excretions are extremely virulent. The media of infection are aumerous. The chief symptoms of the discase are high fever, severe feetild diarrhea alectated mucous membrane of the mouth and extreme dehility. The death rate is very high. No satisfactory treatment has been hitherto found. However the loss may be averted by resorting to timely preventive moralation.

Ont of the soveral methods of preventive inocalation, 'Scrum alone' is the only one in rogge in India. It consists in the subcutaneous injection of varying amounts of scrum derived from the blood of the hyperimmunised bovines. Immunity from 'scrum alone' inocalation though very about (2 to 6 weeks) is sufficient to tide over an outbreak particularly if affected cases are separated from healthy stocks and strictly isolated. Inocalation will have to be repeated in order the prolong the period of immunity. To obviate this drawback of short immunity it has been recommended to mix healthy animals with the diseased at once after their inocalation. Exposure to infection results in a mild form of the disease being contracted and immunity is consequently active and durable. How far this is wise is, however, still a very moot question.

Rinderpest Inoculation scrum is prepared at Maktesar on a large scale and veterinary graduates from all provinces in India are given special instructions there in the method of carrying out the inoculation. As a result, efficient veterinary aid can now be had almost at their door by most members of the public. It is given free of charge and in any part of the Bombay Presidency, and indeed of almost all India. During the year 1910-11 nearly 10,000 head of cattle the majority of them being halls and hallocks have been inoculated in the reveral districts of Bombay. Only nineteen of them are reported to have died after inoculation some of them being within the period of incubation. The fore-going number is a sufficient evidence of the advantages to be derived by preventive inoculation. It affords a great deal of satisfaction

to note that people are beginning to appreciate the utility of inoculation and that it is getting more and more popular. Strict solution of the affected animals, inoculation of the healthy animals immediately after the outhreak and sanitary conditions in the localities go a great way in suppressing the virulence of the dhease. Through extension of preventive inoculation it is expected that the disease will be, if not completely evaluated the tricity under control in the future.

# Experience with Wild Pigs and Successful Methods of killing them by Poisoning

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TO hill-side cultivators, wild pigs are the greatest pasts of certain cultivated crops. In consequence of the immense damage done by the pigs to the cultivators, some of the villages situated near hills in the Carnatic and elsewhere, have been entirely deserted and a large portion of good cultivable area in the Presidency is thus lying waste.

The trees, shrabs and general scrub growth on the hills, with the boles and crevices in the rocks afford the best condition for their living and multiplication. Hence a great many pigs are invariably found causing a great maisance to the cultivators of such villages.

Before going into any more details, it may he stated that the following are the crops attacked by wild pigs given in the order of their choice for eating.

Ground puts.
Maize.
Sweet potato.
Sugar-cane.
Gram.
Jowar.
Bala.

Bajri. Tur. Safflower. · Paddy. Wheat. Cotton (green bolls). The ripening ears of paddy and of wheat and the green bolls of cotton though not greatly attacked here at Gokak, are exten and damaged to a great extent elsewhere. They do not limit themselves however, to a vegetable diet, and often scratch near trees or in mannre pits for grubs of beetles of which they are extremely fund.

The crops that are entirely immune from the inroad of pigs are :--

Chillies, turmenc, ganger, omons, garlie, Khapali, betel leaf, plantains and other fruit trees etc.

Although it is very difficult to give with precision, the extent of cause! In wild pigs to the different crops, still it can be said with certainty that it amounts to not less than fifteen per cent of the favourite crops even with the most careful and regular watching. A greater amount is damiged by their trampling than is actually eaten. Generally a number of wild pigs consisting of adult miles, females and young ones, rish suddenly inside a field and commence devouring the crop. They will go on exting and duringing the crop till they are threatened by the watchinen either by pelling stones or by carrying loudly. The watchinan during the night sits on a raised platform erected here and there at some short distances in the fields with stones and dogs for watching lest he may be attacked by the pigs if on the ground. If unopposed, they will eat and consume a good deal in a very short time.

There being very few natural enemies to wild pigs, they increase in numbers very rapilly though a few of them are shot or killed occasionally by hunters &c

Foot and mouth disease is, however, very fital among them, much more so than among hovines. The mortality from this cause it is said often goes to five per cent or more.

The village of Arbhan in the Gokak Taluka where the Government Farm is stunted it just near the foot of sand hills which greatly abound in wild pix. The enthirators of the place, therefore, have to ene unter the greatest dishedless in the growing and watching of the more important and profitable crops. On the government farm standing just opposite to the sand hills, will pigs began to come in great numbers, and a very heavy loss was threatened, inspite of a number of men kept for watching the crops during the night. For ventive remedies but therefore to be adopted. A tour strand hyped

wire fencing with wires ten inches apart and a stone wall four feet in height in front were put up to prevent the pigs from coming inside the area. It was soon found that the pigs after sometime began to come in either hy jumping over the stone wall or getting between the first two wires or hy making a hole below the first wire in the ground. So two more wires hetween the original lower wires had to be put in to make the fencing quite proof against the pigs. The stone wall also had to be mised in certain low places where there was opportunity for the pigs to jump.

The cost of putting up a six strand barbed wire fencing with iron standards comes to about Rs. 1500 per maning mula, while the cost of a similar harbel wire fencing with wooden posts comes to Rs. 1100 per maning mile.

The cost of constructing a stone wall (stone heing available just in the neighbourhood) four feet high and two feet thick comes to Rs. 840 per running mile. Daring the time the above works ware under construction, certain other methods for preventing will pigs as described below were tried of which the poisoning method was a great success, being at the same time very cheap.

(1) A temporary but very effective pig proof sence meant for protecting a sugar-case outside was made of galvanized wire netting sour feet high with sour inch mesh, wrapped round sterr (sestania aggretics) plants grown very thick round n sugar-case field.

The cost of wire-netting comes to Rs. 16 per fifty running yards. This also prevented nickals from getting inside the sugar-came crop and damaging it.

- (2) A drain five feet broad and four feet deep dug round tha area was of no use in preventing pigs as they easily jumped over the same.
- (3) Attempts to attract wild pigs into traps were of no avail. Pits twelve feet square and ten feet deep were dag in the most frequented places and filled loosely with rubbish and soil. On the surface of this groundants and mairs were spread to entice the pigs to go there and fall into the pit. But it was found that not a single pig was thus trapped, even after a long time thangh more than a dozen buffaloes fell into the pits.
- (4) Lastly the most effective and enccessful method tried was that of poisoning. The poisons experimented upon were arrenate of evda,

Copper salphate, potassium cyunide, oxide of presoic (white arsenic) and perchloride of mercury. Of these, the oxide of arsenic has heen the only successful poison insamuch as it has no smell and corrosive action. If a fairly large dose of this poison is taken internally by the wild pigs it produces chloric symptoms accompanied by extreme thirst and the animal is found dead in twenty-four to seventy-two boars near water courses and pools. The action of the poison is especially rapid effective in the hot season. The number is suduced to eat the poison by preparing it os under.

About five tolors of wheat floor are mixed with u tola of oxide of proper consistency so as to turn it into round ball. Groundant kernels are placed here and there on the matside of the balls. The balls to gether with some extra groundouts, pieces of sweet potato and maize and cobs &c. if variable should be placed on the most frequented paths in the hills. The wild pigs coming from the hills by night, will on their way smell the groundants &c. and are thus led to eat the poison with the haits. In no case the ball contining the piscon should be kept in the growing crops as the animals and likely to be tempted to the ball from the crop or perheps the pig may altogether lose sight of the seme.

The greatest care should be taken to see that the poison is not then by work cattle oud other domestic unimals. It should be kept in places frequented by wild pigs after it is dark wheo all the farm bullocks are taken home and removed very early in the morning, before the cultivators leave for their fields. If ooce the farmers in the surrounding tract are ioformed of the deadly effects of the poisoo, they will be very careful obout their unimals. However the poisoning should be undertaken only by an educated man knowing fully the effects of the poisoon or the different namels.

Another difficulty arising in the poisoning of pigs is that the animals eating the poson will not due on the spot but will expire somewhere in the hills and will thus escape detection. The illiterate Mahars and Vadars especially working in stone quarries on the hills on coming ucross the dead bodies are likely to cook the same and eat and may thus be injured by the poison. It is therefore quite essential to give a wide circulation amongst the inhabitants in the neighbourhood before undertaking experiments with possoning.

On the Gokak Canal Farm where these experiments were conducted, the poison was kept in the area which was only accessible to pigs as it was enclosed by 5 struds of barbed wires and thus the danger of its being evten by domestic animals was avoided. With the co-operation of the district revenue authorities and the public, the other difficulty was got over by the issue of an order to the residents of the different villages in the neighbourhood that no dead wild pigs should be either sold to others or eaten.

During the past three months of the experiments, about a hundred pags were killed by poisoning at a cost of about Re. 6. It is therefore hoped that with the co-operation of the public, a good many pigga might be successfully poisoned annually and that the cultivators in the stilly tract might thus be easily rehered of the most dangerous and harmful next which causts at present.

# The Effect of Drought in an Ahmednagar Village

BY

M. M. Rasai.

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[ The pre-ent article from the pre- of a calivator of Bhingar near Abmedingar, and a latge grower of laceme under well irrigation, will bring vividly before our readers some of the difficulties really felt by cultivators in many of our eastern Deccan districts. The article was written early mo October 1912. Eds ]

The district of Ahmedinagar in which I reside is usually dry. On the average the rainfall is about tweaty-three inches, which chiefly falls during the mucuths of July and September. In the present sensor, until now, there has been sexicely four inches of rain. Incerne which is the principal crop in my village is dring up, because the wells on which we rely for irrigating it are giving much less water than we usually expect. The price of foller is rapidly riving day by day, and, on the other hand, the price of cattle is rapidly filling. A good ox, which a few months ago would have cost Rs. 40 -is, as a result of the drought, now sold for Rs. 20 -, and as for inferior cattle, neonle will

not accept them as a present. All the tanks and rivers are shrinking, and the springs which feel the wells are disappearing. All over our fields which are not irrigated, where usually at this season there is a garment of green grass, the human eye can see nothing but brown hare land. We read in the newspapers of rain falling in other places, even in exceptional abundance, and we hope from day to day that we shall be favoured. But each day is as dry and scorching as the last, and so far our necustomed rain in September and October has almost completely failed us. We hear that some of the villages in this district are actually deserted, not so much on account of scarcity of food as on that of water. Cattle are dying in untold numbers, again chiefly on account of lack of water. Butchers key up the summlas at a cheap rate, and they alone seem to be hencefling by the condition of things.

To whom are we poor farmers to look now when the conditions seem altogether against us? What is the Government to do under these circumstances? When there are seasons of trouble other than those from which we are now suffering, the Government no doubt employs every means within its power to remove the worst miseries of the unfortunate cultivators. In the present case, the authorities have done their hest by supplying fodder to the farmers ut a very moderate rate. But that is, after all, a help from without, and help of this nature is sure to last but a very short time. We are very greatful to Government for what they have done, but when these troubles occur one after auther, our minds suck down under the impression that we caltivators are sure to be rained some day or other in the near future. This despairing attitude is the prevailing one among the cultivators round here this year.

Still there are some hopes of relief. For the last three days dark clouds are gathering in the sky in the evening, and in few drops of rain have fallen. This rain, though of preticially no ase, creates hopes for the future, and is looked upon in the same hight as a very little water poured into the mouth of mus in a great desert would be, where nothing but the heaven above and sand below can be seen. While we were out two or three days ago we had a slight shower of rain on our way, we took off our eight as if to welcome a long expected guest, and counted it a great blessing to have our heads wetted by the rain that fell. The following day we visited several cultivators, and usked them whether the slight shower would be of any value. They replied that just as a small piece of bread placed before an exceedingly hungry man makes

his hanger felt even more, so, similarly the shower would be of no practical use in the case of a crop which has been parched by the scorching beat of the sun daring almost the whole season.

This is the po-ition at present.

(It is pleasant to be able to note that one good rain did occur a few days after Mr. Raval wrote as above, and another substantial shower in November. There have mitigated the worst of the position, but still the condition of the Ahmednagur district is very precarious (16.12, 12. Eds.).

# The Damage of Cotton Seed by Various Gins

ВT

### Kulkarni, I. S. B. Ag.

EMHE following is an account of some experiments I made recently
at Dharwar to ascertain how far different gins damage ootton
seed to be used for sowing proposes. The matter is a very important
one, the more so sance it has been shown by Mr. G. D. Mehta that the
germination of many samples of cotton seed used for sowing is not
much more than thirty we rest, chieff whe to damage by the gin.

The way in which I proceeded is as follows :--

I got four bags containing Kumta cotton seed obtained from four directors gias, namely (1) Single Roller Machine gia, (2) Japan gia, (3) Start Hand gia, (4) Foot Roller gia. Cotton from the same well mixed heap had been used for ginning and after ginning, a bagfal of seel was taken from each heap, cue hang taken that each heap was homogeneous. I took five samples from each bag, each sample weigh, ing about three tolas. Thus, I had twenty samples in all. In each sample, I counted the number of total seeds, sound broken seeds and dassased broken seeds. Seeds which had been sound but were broken ). The following statement is the average of five samples in each case.

	Total 1	roken seeds.	Sound broken seeds.	
		%	%	
ı.	Single Roller Machine gm	5.22	3.98	
11.	Japan gin.	1.55	.72	
	Sprat Hand gin.	-79	•41	
	Foot Roller gin.	6 12	5-97	

I do not attach much importance to the number of diseased broken seeds. They are of little at no use from the sawing point of view, because, they nearly cannot germinate, and if they germinate at oll, they give rise to weak seedlings which will die after a short time.

From the above figures, one might come in the conclusion in once as Sarit Hand gin is the best and Foot Roller gin is the worst from a sowing point in time. But this is by no means true. The percentage of broken seeds alone does not give us any idea of the real damage done to the seeds. Much depends upon the nature of the breaking. In me case, almost all broken seeds may germunate and in another many of the broken seeds may fair to germunate. For instance, in the case of 'Foot Roller gin' only the upper portion is slightly removed and consequently here in the case of many broken seeds, the power of germinotion does not seem to be lost. In the case of 'Single Roller Mochine gin' seeds are actually crashed so that the living germ or the embryo within is entirely destroyed. It needs, however, a germination test in order to ascertain the netural amount of draware dune to seeds.

I was obliged therefore to fall back upon germination test of sound broken seeds. I collected all the sound broken seeds picked from the twenty samples I had taken for observation and made a germination test according to the instructions given by Mr. G. D. Mehta in his article un seed testing in a previous number of this Magazine.

The result of the test is an under :-

No. of sound No. of seeds No. of seeds
Gins. broken seeds. germinated. not germinated.

I. Single Roller Machine

	gin.	126	19	107
	Japan gin.	30	16	14
	Snrat Hand gin.	11	5	6
14.	Foot Roller gin.	186	180	6

We may say that the Foot Roller gin gives hardly any injured broken seeds. Almost all of them have germinated. In (1) out of 126 seeds, 107 seeds have failed to germinate. In (11) ont of 30 seeds, 14 have not germinated, and so on. We have already found out the preentage of broken seeds in each case. Those broken seeds that have managed to germinate are not to be considered as damaged at all. The above set of figures gives us an idea of the actual damage caused to the seeds. Thus, we can easily find out by a simple rule of three the percentage of actual damage.

	um.	per cent.	value from sowing point of view.
I	. Single Roller Machine gin.	3 35	4
77	Tanan air		3

ш.	Japan gin.	•72	3
	Surat Hand gio.	•43	2
	Foot Roller gip.	•29	1

Thus, we come to the conclusion that if we want to have cotton ginned if we want to get seed for sowing purposes, Foot Roller gin is the best of all and is worth recommending to enlitators for this purpose.

# The Experimental Renovation of an Orange Plantation

EY

#### G. B. Patwardhan, B. Sc.

Superintendent, Ganeshkhind Botanical Gardens.

SN the month of Jamary 1912, Mr. G. B. Kockar requested Mr. Barns, Economic Botaulst to the Government of Bombay, Poona, to visit his orange orchard at Kirkee and give advice with a view to effect improvements. Accordingly the place was very carefully examined by Mr. Barns and myself. The garden was said to have been planted about sixteen or seventeen years back. Out of about four hundred and fifty trees originally planted, only 273 including Pomelos have continued to drug thrie existence through various printly of

173

heglect and perhaps over-cropping also. The trees were not yielding a reasonable outturn; they were sickly with many dead or dying brunches and the owner had abundoned all hape of them. These two bundred and seventy-three trees do not stand in a single campact block but have several blanks in them. There are on ur two clumps of hardy individuals standing segregated and quite apart from the rest, the intervening plants having died away completely. Many of the remaining stood as mere unshapely skeletons of thick wood with loosened bark and n few stray branches bearing a few tufts of green levres here and there. Some looked completely dead but for a slight faint greenness at the hase of the stem. Borers had mada a home in the living trees and webs of Arbela tetraonis were seen on almost all inf them. There were many which though in a very had condition still yielded some fruit though not in a paying quantity.

On a full consideration of the condition of the trees, the probability or otherwise of their renovation and the amount of capital expenditure the owner was prepared to mour immediately, it was proposed to try au experiment to renovate some of the more honeful of the trees by (1) pruning all dead shoots and large dying branches, (2) removing discused portions of them, and (3) thoroughly clearing up the area underneath the trees. Accordingly, an estimate was prepared by me giving the probable cast of carrying ant all the proposed operations. A copy of the estimate is given below. The estimate provided for thorough prucing and hygiene and in addition, alternative schemes of cleaning the whole or mort of the area according to the amount of capital available immediately. While going aver the said estimate, it should be noted that the calculations were based on the assumption that the area to be worked was about sixty gunthes. On actual measuring, however, it was found to extend over only fifty gnathas. Each at the plots referred to in the estimate as 'one-third' and 'two-third' areas were also senarately measured on the 2nd August 1912, and were found to be nineteen and thirty-one gunthas respectively ( a guntha = 1 acra ).

The Estimate.

Re s.r

(1) Pruning:—The first absolutely necessary operation is that of pruning all ald and dead wood &: 205 trees at the rate of one man for 4 trees a day 66 onits at 0-6-0 per unit...

(2) Digging out whole area thoroughly. Americal pruning it is advisable to do a thorough digging of the whole area which measures 60 gunthas sufficient for 450 trees which number were planted some 16 years back. The land is hard and solden and full of roots of weeds and so cannot be ploughed deep without interfering with the trees. Digging must be done. Cost 175 cn. ft. per unit-equal to 472 units in all at 0-6-0 per unit, all digging to be one fnot deep only ... 177-0-0

(3) Onlinary digging round roots only. - Now if su licient capital is not available to dn the whole digging thoroughly, it is advisable to do ordinary digging at the roots only, manuring, and making beds, and prigation channels for all trees ( 265 ) total units 66 at the rate of 4 trees perday per man plus wages of 40 women to carry manure for one day

(4) In addition to the work mentioned in para 1. thorough digging of one third the area should he done thus sprending the estimated expenditure of Rs. 177 over 3 years. Therefore digging onethird area costs Ms. 59 and 2 area Rs. 16-the total is ...

75-0-0

ging and making beds will be ... (b) If the whole is finished by simply digging at the roots only-the cost is

(5) (c) If the whole is thoroughly done the cost of dig-

177-0-0 31-0-0

(c) If one third area is also thoroughly done the cost would come to

75-0-0

(6) The subsequent expenses will be for irrigation and stirring up of soil and water charges: (a) Irrigation a maximum of 25 irrigation turns at the rate 2 units per turn at as. 5

Rs. 16.

(b) Stirring soil about 6 times (maximum) at the rate 6 units per turn equal to 36 units Rs. 12.

(c) Water charges at Rs. 10 per aere Rs. 27 ... 45-0-0

The total cost us at present advisable to be incurred will come to:

Pura (1) Rs. 25 (4),, 75 (6),, 45

Rs. 145 Rupees one hundred and forty-five only.

(7) The cost of supervision extra.

In the above estimate one unit of labour means one man for one day's work, i. e., 66 quits means 66 men for one day.

(8) The present trees will last only about five years

- more. The value of the crop per tree may be estimated at Re. 1 per tree for four years. To have some trees coming into bearing when the old ones are taken out it is recommended that from 100 to 200 new trees be planted. This will mean a considerable addition to the above estimate, however.
- Mr. Kotkar's son who was studying as a Horticaltural pupil in the Ganeshkhind Dotanical Gurden carried out all the operations with much zeal and carefulness. The following are the results of the trial.

Pruning:— All the trees were pruned daring Fohrary and Mirchy
the cut suffices were tarred. Borers and grubs were scarched out and
destroyed. Mr. Kotkar, justor, himself dal also sowe portion of the work
whenever the pruning man was employed by him elsewhere. The cost of
the operation was Rs. 20. The quantity of dried wood collected weighted
120 list, valued at a minimum Rr. 1 only. After the panning and noted
the time of writing 30 trees have completely direct apparently on account
of (1) the inpary caused to the already weak and unshealthy rost system,
by the inevitable shaking during preming and probably (.) the shock of
pruning sastained by the trees after a long period of drought of the year.
Some of these trees had to be out through and through in search of hovers
which were so abundant in the plantation.

Two-thrids the area (31 gouthas) was thoroughly duggreer by hand, clods were only partially broken as thorough pulverisation of the hard clods seemed impracticable at the time. Bals were made and minute consisting of cattle and house refuge given at the rate of 3 baskets

(60 lbs.) per tree. The above operations with the exception of root pruning and minuring were finished by the 23rd of February 1912. This plot heing held in reserve for the Mrig bahar was root pruned and manured later on und the first irrigation given on the 29th of June. The cost of all the operations indicated was Rs. 67-6-0.

The one-third area (10 guesthas) was given ordinary digging round the roots at the end of March, roots were exposed for a short time, pruned and manurel. Irrigation for the first time was given in the first week of April for the Ambe bahar. The cost was Rs. 15. This plot was subsequently cleaned, Hariyala grass (Cynadon-detaylon) was dag ont by hand and the soil will polverised in June without injuring the roots which were by this time in a state cfactivity and vigour as a consequence of their being started into growth by the irrigation commenced in April. The irrication facilitated the breaking of cluds and re-making of hed and in consequence the cost for this was low. It was Iss. 144-40. The total cost of improving this plot was Rs. 294-40. It must also be remembered that this plot contained some blank areas which was not laund due plus were plonghed.

Now let us see what was the effect of these operations upon the trees. For this I give below the testimony of Mr. G. B. Kotkar who wrote as follows in his letter dated 4th August 1912.

"The result of the operations was very satisfactory. The trees reterved for the Mrig-baker bore abundant blossoms in Jane. It was a spleaded sight to see and enjoy the fragrance of the flowers. The Ambebahar trees began to throw new shoots with some flowers here and there in the list week of Mirch, and showed signs of improvement. The number of trees at the legioning of theoperations was 273 including pomelos whereas the living trees now existing are 243 only. It is to be regretted that the heavy rain of the 21st July, which flooded the whole of my gardlen ground and Appet all the trees for nearly 30 hours, his distroyed almost all the flowers and left the trees pile and weak. But I hape that next crop might be more satisfactory and the trees will still assume an improved aspect hereafter."

The flooding above referred to by Mr. Ketkar was due to the very high floods of this year of the raver Mala near the banks of which the said orchard is stituted. On the mensing of the 22nd July, the whole orchard was completely submerged not even a single tree crown being valide. It will be noticed that but for the damage caused by the unforeseen accident of high floods, the experiment was n decided success.

In conclusion, I wish to express my smeere indebtedness to Mr. Kotkar for giving us the opportunity of making an experiment regarding the possibility of renovating an orchard and for keeping careful accounts of expenses incurred over the orchard for the purpose of the operations.

Past Students at the Agricultural College. The Present Causes in Agriculture.

В¥

K. B. Bhagwat, B Ag

To,

The Editors.

The Agricultural College Magazine,

THE POONA AGRICULTURAL COLLEGE.

POONA.

Sirs,

ERHAPS the most interesting item in this year's Social Gathertic ing of the College was "The Social Intercourse between the present students of the College and the Professors' neid on the first day of the Gathering, ramely on the 22od November 1912. Although owing to the heavy downpour of the rams, the programme of the Gathering of that day was cancelled, this item was kept. We had a fairly representative meeting, their being about twenty gradintes from Poona and its surroundings, as also Mr. Bhandiwa'l from Gokik and Mr. Athale from Sugli. As the intinations to the gradintes went rather late, gradiantes from other places could not attend the meeting. We hope to make the meeting more representative next year. For the heacht of those who could not attend the meeting, a summary is given below:—

The proceedings opened with a short account of the objects of such a meeting by Mr. Ramrao, (lecturer in Entomology) who proposed.

Dr. Mann, Principal of the Agricultural College, to the Chair. Next a paper was read by Mr. Bhagwat on "The suitability of the present courses in agriculture to produce practical agriculturist".

Mr. Bhagwat said that as the posts in the Agricultural Department were now almost filled up, there was very little chance for our graduates to get any entrance in that Department. The only thing left for them was to take up agriculture as a profession, but our three years in the Agricultural College did not fit us for this. The course as at present was too crowded and was a compromise between the needs of research students and those of practical agriculturists. It ought to be made more practical by weeding out some useless subjects which are of no material benefit to a farmer. Some new subjects such as Mechanics and Agricultural Economics ought to be introduced. At present we were neither fit for research por to take up agriculture as a profession. He also pointed out one great difficulty that n graduate in agriculture had to face, namely, the lack of accurate local information about agricultural conditions in a district, and for this purpose he wished that a survey of our Presidency should be made. He concluded with a suggestion that if the general course were rearranged somewhat after the model of the present "Short Course" when only the most important and practically useful subjects are taught, the course would be immensely improved for the great majority of the students, because after all the opportunities for research were limited, as also the number of stadents who would in any case take up research as their profession.

#### Discussion 1-

The Discussion was opened by Mr. D. L. Sahasrahuldhe, (Lecturer in Chemistry) who raid that the Course in our College must be divided into two brunches:

- (1) Research.
- (2) Fractical Agriculture.
- Research Statients ought to stay with the Professors something after the fashion of the Guru and Skiskya of olden days-Research methods could only be learnt by constant association with experienced persons engaged in Research.
- (2) Those who want to go in for practical agriculture should not be made to stay on experimental farms but on farms managed on a commercial basis and for this be wished to have model farms.

If this was not possible, he wished to have a Post-Graduate Course; but this involved a great loss of time.

Mr. P. C. Patil, (Dirisional Inspector of Agriculture), said that more practical business training was necessary for our graduates. He stated that in England too, from what he saw there, the coarse was not very practical. But in Ireland the coarses for research and practical agriculture were separate. Their farms of nearly one handred fifty acres were run by stadents and teachers. In Holland a still better are was taken in producing graduates. The vincations of the college were utilized on well managed farms of England, because in England the farms were better managed than elsewhere. After graduation, our graduates should be put an some private farm for a year or so. He emphassed the necessity of an agricultural survey of each locality. This was a much felt want. For this separate men were required.

Mr. B. S. Patel (Assistant Superintendent of the College Form) of emphasized the necessity of n survey. Our information, he said, was very meagre. We had to depend on the volumes of Messra. Mollison and Mehta which are natiquated. He suggested that there should he a Graduates' Association, which should take up one subject every year and thrash it out. Before joining the College the six months that intervene between the passing of the Previous Examination and the commencement of the essions at our college should be spent by the students on some Farm.

Prof. Burns, said that if the two courses were sepamted there would be so much more work for the Stadi. The Professors in this college were not whole time Professors but had other duties. The Principal was a Professor of Chematry and Agricultural Coemist to the Bombay Gwerament. Next he described a Course of Medical Stadents in Edinbargh which he suggested should serve as a model for a professional course in agricultars. In that course the first year was spent in learning pure sciences and during the next three or four years only those parts of science bearing most directly on his professional work were learnt. The same thing could be done in our college. He additted that in the present course at the Agricultural College a good deal of pure science c. g., classification and morphology of fungi was tanght which was not of much use in practice. Ou the other hand important practical applications like horticulture were comparatively acglected. He said that a post-graduate course was quite a necessity, but he could

not see how that could be arranged with the present staff who had both teaching and administration to do.

Mr. G. N. Sahasrahnddhe (Sugar Expert) suggested optionals for the  $3\mathrm{rd}$  year.

Mr. V. K. Kogekar, led great stress on the surrey of local conditions. The backward agriculture of one province mry be improved upon by improvements introduced from another. He quoted his own experiences as the organiser of the Decean Agricultural Association in this matter.

Mr. V. G. Gokhale (Superintendent College Farm) said that if the College did not serve the purpose for which it was started, improvement was necessary, and it was little nos going on as at present. We ought to have specialised courses for the two branches for research and practical agraculture; for the latter anybody might be admitted. It should not be made a rule that only the sous of the agriculturists should be admitted. He explained how he, though not the son of an agriculturist, by strong will could create in himself a love for agriculture and sud that he would compete with any agraculturist now. Their main difficulty was a smattering knowledge of all onlipiets which put us at a great disadvantage when dealing with practical agriculturists. Accurate information was necessary. We graluates had no confidence in ourselvés and wanted more instances like Mr. Bhagwat. He also nouted out the necessity of model farms.

Dr. H. H. Mann, remarked that he agreed with the Lecturer that the present Coarse was a compromise and like all compromises not very satisfactory. It was not the best either for research or for practical purposes. But at the same time it helped to produce the embryo farmer and the embryo research man, who could develop into the perfect research man according to the conditions in which he would find himself. He was sorry to find that people expected a college to produce finished products. It was not possible for any college in the country to do. Various remedies were suggested, some wanted two entirely different coarses. This would bring in the question of costs. The cost per head in this College was already more than in any other college in the Presidency. Even if the course was not split up before the third year the cost would be still coasiderable. Besides men who came here did not know what to do. It might happen that a student might take up some subject as his favoured one and might afterwards

repent of having joined that brunch, if he did not find opportunities for his subject. He had discussed this point with Mr. Kettinge and Mr. Smart, who wished that optionals shoult be put in the Course. But when this difficulty that the min did not know their minds was pointed out, no way out of it could be seen. He saw almost an imposible position. Some auguested a post-graduate Course. He had in hand some fellowships, but then our men when they had completed a three years course in college could not afford to piss one year ou a farm or in research. Be-dies our forms as they not standed at present and some private land-lords winted men both knowing something of research and something of practical agriculture. For them our Course was quite fit. He wished Mr. Bhagwit's piper to be protein and circulated amongst all the Griduates of the folloge and opinious should be solicited from each on this question, so that next year when we might come to a defaute quederstanding on this point.

In this meeting after this interesting discussion, a proposal was made by Mr. V. G. Gokbule to establish an "Agracultural Graduates Association" which he said, would as an important authorizative hody would solve many of the difficulties of our graduates stationed in various parts of the Premiency and elsewhere. The proposal was seconded by Mr. D. L. Sibusabullo, who suggested that a Committee consisting of the following gentlemen by appeared to oursiler about the rules and regulations of the Association at an early date:—

Mr. P. C. Patil.

Mr. G. N. Sahasrahuddhe.

Mr. M. G. Athale.

Mr. K. B. Bhagwat.

Mr. V. G. Gokhale, Secretary.

This Proposal was carried out.

A vote of thanks to the President was proposed by Mr. Kegekar and carried.

Believe me, Yours faithfally.

K. B. BHAGWAT.

## Two Recent Agricultural Pests

ÈΥ

#### Ramrao S Kasargode, L. Ag.,

Lecturer in Entomology.

[The following is the substance of a report on visit to Halkarni in the Belgaum district, and to Nessk, in connection with reports of serious damage by maset pests. There are a considerable number of new observations contained in the report, which should be widely known. We shall await with interest the result of the experiments outlined against the rose feet feetile. Eds. 1

I reached Halkarni seventeen and n balf miles from Belgaum on the Belgaum-Vengurla Road an the 30th October 1012. I found Mr. Bhikaji Shripad Nadgauda in the village. He necompaniel me to his fields of Ruce, Nackan, Nagit, Varan and other milleta as well as to a large grass area owned by him The chief trouble in these parts is a swarming type of caterpillar probably of the genus Enxoa Fam Noctaidae. At the time of my visit the grass had specially been stacked. The leafy pertions of the grass had been eaten mp and the flower stalks and a few fibrous portions of the leaf only could be seen standing up. The grass ext-nds up to the tops of small hills and the slopes are covered by it. The jungle grawth here and there cats up the grassy slopes, though not very dense, offers difficulties in the extermination of the past by mech snical means which otherwise would seem to offer some hopes of success.

The grass area, in places of a mere open nature, has been cleared and hill milited his on hani, sears, careā, &c. are grown. When the caterpillars had caten up the grass, they in many places have attacked these milited and cussed a considerable amount of less to the cultivators. In most places the caterpillars had pupated or were just parting in the soil. The area nuder the hill milited cleasts a lyana that under tice. The rice had not been touched up to the time of my visit but that which occupies the lowest portions of the cultivated area might still well be attacked as it required still fifteen to twenty days before harvesting. I, however, asked them to dig treaches to cut off the advance of these caterpillars from the adjoining machan and cares plots. When once the nes is harvested there is very luttle that the caterpillars can

est. The local name for the pest is  $\widehat{un}$  Shir. From the nature of the attack and previous history this pest seems to be of a sporadic kind occasionally appearing upon crops, and its appearing cannot with certainty be foretold. It was seen in 1902 and again in 1908 but on both these former occasions the pest was not very serious. I asked the cultivators to plough up the enlitivated areas of millets from which the caterpillars seem to have desappeared. This would expose the juppe and kill many. I advised them also to have recourse to the hopper bag to collect the caterpillars and destroy them when on any future occasions the pest makes its appearance.

The cultivators wanted information on two other pests of Rice which make their appearance generally in August but could not get any conclusive data sufficient to venture a guess as to their nature. But Mr. Nadganda promised to send me specimens next year. They call them by the names Sheda and Kul, 477, 4617.

#### Nasık.

I started for Nasik on Monlay the 4th November and reached it on Taesday morning. I visited a number of gardens to see if the Ceramby-cil heet's Stienness grisator had appeared this year as it did last year about this same time. But cowhere it has appeared up to this time. But it might do so later on us the heetles continued to appear up till January.

The vine leaf beetle 'coloidun'a strigicolles was found in a unmber of gardens but dal not appear to have caused much damage. In one isolated garden owned by a mult this beetle hal done considerable during but the man could not be got to give his consent to allow his garden to be sprayed. At list I was compelled to ask Mr. II. V. Gole himself to give his own gurden for trial. This garden is about an acre, surroundede by a hedge. There are other gradens at some distances apart within two to three hundred yands ratin. He has given the whole garden in my charge for a whole year and I have arranged the following programmes of experiment.

 The stems of the vines should be cleared off all the loose bank which affords a convenient shelter for the beetle to hide during the day time.

<sup>&</sup>quot;What is almost certainly the aumo post has almost completely destroyed the grass crup this year [1912] in the neighbourhood of Belgaum,—and in addition has done very settious damage to sugar-came. In the case of the latter crop, some patches were actually killed out by the caternilar.—II. II. Mann.

- 2. First spraying to take place in the last week of November with Lead arenate at 1 oz. to four gullons of water.
- 3. Second spraying to take place just after the cold season to kill the heetle that come out of hibernation. The strength shall be the same as that in the first spraying.
- 4. 3rd spraying (only if found nece-sary ) just fifteen days previous to the pruning for the Amba Bakar.

Mr. Gole has got the spraying outfit ready and has promised to supply it gratis for the purpose of the experiment. He only wants the belo of a trained errayer, which I have promised him.

## Our Farmer's Prognostications

B₹

#### K. K. Bhatarker.

IT would seem to be of advantage to collect together the methods by which our Gupaatt farmers con-ader they are able to forceful weather conductions which are likely to arise. Whether the methods which they employ and the indications with a they observe give reliable results in all cases miny be a matter of doubt, but there is, by almost noniversal consent, often a good deal of reliance to be placed on the well considered opinion of a cultivator. It is the purpose of the present article to give some account of the things on which they have their opinion.

Our cultivators in Gujarat generally count their new year from the third day of Vasshabka, the mouth embracing the latter part of April, and the early part of May. The ordanry Hudu quer begins in Kartik, but to the cultivator the beginning in Vasshabka is much more important. It is unally on the than day that their tillage for the coming season is commenced. At this time certain facts are noticed which are supposed to give infallable indications of the season. Some of these facts, which evem worthy of note are as follows:—

(I) The nest of the crow is circfully observed. If it he in the middle of a tree, abundant rain may be expected: if it faces the East,

the season will produce good crops: if it is turned to the West side, the year is lakely to be a bad one.

- (2) The eggs of the ball known as Titudi in Gnjarati (Mantha-Titus, Sunkrit-Tittibhe) give indications. This bird only lays four eggs. If these eggs are lud on a high ground and if all of them are laid erect, the rains will pour in great quantity and in all the four months of the monsoon. If one of them is not erect, in one of the four months, it will not rain; if two are so, the rains will not fall abound natly in two months and so on. The philosophy of this is that, that the bird has got sufficient instinct to know whether the rins will be abundant or otherwise; and so in order to save its eggs from being carried away by rain water, it lays them on higher ground.
- (3) The Holt feetival is one with ball of us are famplier with. It is a fire-feetival. On this day a pile of wood is set on fire, with much ecromony. It is generally the custom to attach loc-ely to the middle pole a small dig. This flag, we all understand must fly away owing to the force of the flame of the fire. It is the falling of this flag in particular direction that has concern with our subject. If the flag files away and falls down in the Destern direction, then the year is beneficial to cultivation; if it fulls in the fire, or in any other direction, the year is likely to be fallere.
- (4) A peculiar method of observation is one which we are going to trace below. On the New year day ( 3rl of Valshakha ) when the sun is just on the point of setting, two to three firmers go in a point field, taking with them three necks of broken earthen tars. There, they place the necks in a straight line from West to East, in such a way that the rays of the setting sun which pass through the first neck. must ness through the second as well as through the third. The disrance which is maintained between two necks, is generally ten feet. Then they mark the positions of the necks by patching pieces of sticks, taking care at the same time not to remove the necks. On the very night, when it is time for the setting of the moon, the farmers again go to the same place and change the position of the neck in the West at such a distance that the rays of the setting moon may have a direct nassige through it, not forgetting at the same time that the distance which existed at first, between the first nat the last neck, should also remain the same at this time. Then the mildle one is removed and placed midway between the last and the new position of the first. The position of the middle one is kept such as to allow n direct passage to

the rays coming from the first. Finally the last neck is turned in its own place in such a way that the rays presing through the first two necks, may also pra-strough u. The short and consistent, the three necks which at first used to make a straight line with the setting sun, now does the same with the setting mono, with no change in the position of the neck which is in the nastern direction. Then the distance between the two positions of the neck in the west, is measured in foot-steps; and it is said that the grains of daily use will sell ten times the number of foot-steps in nomals per rupee.

(5) The last but not of least importance, is the mode of observation, known by the name of " Khali Bhardi". The mode of observation, under consideration, is important not only because it is practised all over Gujarat, but because the farmers attach greater importance to it and act cautiously against the oval results which would befall according to the observations made in this process. The meaning of the phrase " Khali Bhardi " will not be understood, unless we give a full description of the whole process. On our farmer's New year day, some four or five prominent gentlemen of the village go to the nearest field and enclose there a small area with a temporary ridge, allowing at the same time n short passage for the entrance. In the middle of the enclosed area, four clods of earth pre placed. These clods pre named ufter the four months of the monsoon and on them, is placed u new earthen par full of water. The top of the jar is covered with n piece of journe or bajri bread and at a distance of two feet from the jar, heaps each of a handful of different grains, cotton socile &c. cown in the particular district in which the observations are male, are arranged. The next morning the farmers go to the field and make their observations If the bread his been shifted towards the village, the gentlemen conclude that the villagers will have their bread, if otherwise, the conclusion will also be otherwise. The next thing will be to see how many clods are made wet and to what extent, by the oping of water from the earthen par. This helps them in foretelling about the rains. If all clods are wet with no dry earth in them, they say that the rains will fall in, in all the four months of the monsoon and in spfficient quantity. In short, the conclusion as to whether the rains will fall in all the four months and in sufficient quantity or otherwise is drawn according to the extent to which the clods are wetted. We have already remarked that the clods are named after the four months of the sea-on, and so there remains no difficulty in the way of drawing the conclusion that a particular month will have spificient rainfall or not. Lastly the heaps

of grains are examined and it is stated that any heap in which by nny means the grains have been scattered, will be likely to fail in the coming season.

Such are some of the methols of foretelling weather used by our farmers. Whether any of them are based on sound reasoning, it would be hard to say. But some namally come true, and that is quite enough to maintain the belief is these oll methods of forecasting the rains.

# A REVIEW.

"Solls, Their Treatment and Agricultural Implements".

-By Rao Saheb G. K. Kelkar.

( By a Deccan Agriculturist )

TELERE can he no two opinions as to the fact that much of our hackward agriculture can be improved by the introduction of modern no-to date implements, which will to a great extent save much of our wasted energy, and labour. The efficiency of our indigenous implements is in many cases reduced by the crude nature of their finish. Several instances may be quoted where in one district unite officient implements have been discovered and utilised which can with advantage be introduced into another, where only quite crude simple ones are found. Now that one country is made accessible by means of railways, such improved agricultural methods can be very advantageously introduced into the more buckward districts. We must have only onen eyes to observe and then to adopt to our conditions such improved methods. In many cases implements of Enropean preparation may be found suitable. The irou plough may be quoted as an example. It is not now quite nacommon to see in the irrigated tracts of the Mutha and Nira valleys in Ahmeduagar and Sholapur Districts or in far southward Dharwar district, the iron plough of Rausom, Sims, Jeffries England or the Arlungton plough of America. Much of the credit of introducing these western implements is due to the Agricultural Department of the Bombay l'residency. Some of these western implements, which are generally costly as compared to indigenous ones are nevertheless within the means of individual cultivators, others can be bought by a village on

co-operation, a thing which we have yet to learo. Now that a set of agricultural implements has been placed by the Government for the use of cultivators at district centres through that indefitiguable worker for cultivators Simlar Coopooswami Moolliar, it is quite opportune that we welcome a brochure of filty-four pages by Mr. G. K. Kelkar, Assistant Professor of Agriculture in the Poon Agricultural College in Marathi title i as above. He is the man who has seen the Department of Agriculture in our Presidency develop from its infancy to its present stage and to him to a great extent along with Mr. Mollison belongs the credit of organizing the department of the Presidency; bence no better experienced man could have written this book. When the Poons Agricultural College was founded, Mr. Kelkir was raised to he its Assistant Professor, an honour well-deserved. Mr. Kelkar though on the eve of his retirement is indefitigable in his keepness for the development of agriculture in the Presidency. His energy and eothesism to the pursuit of knowledge is wonderful and many a student has been to spired by the example of this untiring worker in the field of one of the most important branches of industry. The experience of so many years compled with his immense travelling, for no vacation came, but was nultzed by him for studying agriculture in some other province or in his own has made this work peculiarly fascinating for all those who have devoted themselves to agriculture, and no agriculturist should be without this "vide mecam" of modern implements. Mr Kelkir was the life and sonl of Shetki and Shetkari Magazine which has become most uppplar amongst the cultivators since almost all the articles in this very useful magazine were either written by him or at least edited. Hence we find that the language used in this book is quite homely and so easily understood by a cultivator who is literate but generally whose education does not proceed beyond the three R's. Even though the cultivator be uneducated, if this book is read at the Chaods by the Secretaries of an Agricultural Association established in a village, it will serve a very useful purpose. The book is priced at sames eight, a price quite within the reach of cultivators. What makes the book very uttractive is the profuse illustrations and the implements described therein. It gives, in fact, within a small compass all the necessary implements that can be used with advantage by the cultivators either by buying themselves, or by co-operation. Mr. Kelkar has done well as he says in the Preface, in choosing only such implements as ar proved by experiments to have an advantage over the indegenous coes. In the first part of the book a short account of the soils found in the

l'residency are given, nort the chapter on implements. Mr. Kelkar has given the origin of ours, as' well as of the American plough—which is most interesting.

In short, the book is se exhaustive and important that every cultivator should obtain a copy of it. We wish it a great success and hope Mr. Kelkar will bring out many more interesting books on agricultural topics which will be neefed to the cultivators.

# The Work of Local Agricultural Societies and Associations in the North Kenkan

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K. V. Joshi, B. Ag., Superintendent, Alibag Experimental Station.

This not numeral to hear os has been pointed out by Dr. Mann in his article on I Local Bolies as Agents in Agricultural Improvements" in the July issue of 1012 of the Agricultural Journal of India, the question from the Mombers of an Agricultural Association "What shall we do?". I have endeavoured in the following paragraphs to solve the question partly and suggest some of the works that agricultural associations situated in my locality (North Konkan) can begin without much hesitation, if the above question is put by its members with a real desire of work for the improvement of agriculture in their locality. Before proceeding to write, what these works are, it would be worth while to point out that improvement in agriculture of a tract can be brought obout by the fellowing methods:—

- (a) Finding better and new methods of growing crops suited to the lander by continued experiments;
- (b) The transference of better methods of agriculture practised in some parts to other parts of the same or another previous where they are not in vogue.

As regards the first method, the agricultural department has already commenced work by opening a farm at Alillag in the Kolaba District for the North Kenkan: it will be sometime before the results obtained there will be available for this purpose. Useful suggestions cannot be made simply from the results obtained from one year's experiment. The experiments must be repeated with success before they can be re-ported to the public as worth adopting. It would be an unwise plan to advocate new methods of cultivation, manures, or implements before testing their inferiority over local practices for a number of years.

In the merowhile the agricultural association in their locality can commence work in the direction of the second method reentioned above, namely the triosference of better methods of agriculture practised in some purts to others of the same province where they are not in vogus. Taking for instance the Kolabi district into consideration, one will estait there are some parts in that district where agriculture is in a far more advanced condution than in the rest. Let us then see, what are the advanced condutions in these streats in agriculture which the members of the agricultural insociation should try to introduce in the lackward tracks.

In the Alikag tainka the system of growing crops like Ghesda, Tur, etc. on the bunds of noe fields, is largely prictised. A similar practice is adopted on a very invited scale to perts of Mangson, Roba and Mahad tainkis, while it is not seen in the rest of the tainkis.

The crops on the bunds especially the Gherda crop (called नेपत or with the Although thinks ) are a good source of income with very little trouble. The cultivation of this Medhal Cherda is carried out in the slack season that follows the transplacting of rice and so it can be conveniently grown by every cultivator. The preliminary tilinge of diggiog and inverting the top soil of the bunks is done at leisure in the hot season. This preliminary tillage has an indirect benefit of keeping the bonds of the rice fields in good order. The only care which this crop requires after sowing is that of protecting the young seedlings from the attacks of crabs tall the plants climb up the apports specially erected for that purpose. The crop flourishes well after the rains are over without irrigation and continues till January to F.braary giving a good yield of pods at regular intervals. Besides the pads this crop gives a good yield of green folder to the end. The probable cause of not growing each band crops to the backward tracts is the want of information and seed. If the agricultural association will take the work in hand, of supplying information and seed in parts where it is not practised it will be doing permanent good to the cu tivators.

The second work which the association can take up is the extension of the cultivation of rabi crops after the harvest of rice in the rice fields.

The growing of the rahi crops of wal and gram is at present limited to the fields where late rice varieties are grown. The chief difficulty in the way of growing these crops in other fields is the want of noistner in them after the harvesting of rice. This difficulty is got over in the Roha talaks by sowing the seed wed in the standing crop of rice about a fortnight before the harvest. This system of sowing wal is known there as the "hédat" system as the seed is dropped in holes bored by a stick in the wet mn!. This gives a start of whom a fortnight to the crops over that in other fields. If this system is followed elsewhere ratic cops of wal can be taken to fields where intermediate rice varieties are grown. The extension of rab crops like wal in nee fields in the Konkin, should have also for its object, the increasing of the folder supply. In fields where the moistner does out last till the ripening of the pois, the crop may as well be harvested for folder. Attempts, however, should be made in the direction of the extension of growing wal by the 'Aktat' system in the rot of the talaks. This method has two advantages, viz. (a) giving a start of a fortnight over the other method and (b) getting the work of sowing dome in the elsek season before the harvested for several fields.

The third and by far the most important work the agricultural associations can take in hand is the extension of the recently introduced crops of groundnut and jower on warkes lands in the Konkan. It has now been proved by experience in several localities that groundant and jowar can be profitably grown un such lands. In the extension of cultivation of groundant and jowar on a large scale the folder problem of Konkan will also he partly solved. Besiles a good yield of pods, the groundant plants, if dried and properly preserved, make a good and pa-Istable for ler called "Gula" which keep, the cattle in good condition if fell in small quantities every day. The sergham jowar flourishes well even under the heavy raise of Knokin and should be grown in rotation with ground not the workers lands with the object of folder only. If the crop be grown with this object in view two cuttings can be easily obtained from the same crop in one season. The only means by which the extension of these crops is possible is the wide distribution of the seeds, and if the district agricultural association through the medium of the talnks and circle associations with distribute the seed, with proper instruction us to their cultivating in every nook and corner of the district it will be doing a great and substantial work.

The greatest thistacle in the way of attaining success in the above mentioned lines is the practice, in many parts of the Konkan of letting

the cattle stray in the fields once the erop of rice is harvested. Every cultivitor knows what a great maisance is canced by these stray cattle and it is very needful to put a stop to this. This cun only be brought about by co-operation. Many of the troublesome things are checked by "Gachi" rules, another form of co-operation and if the members of the agricultural associations will induce the villagers this can also be put a stop to by the sume rules of Gachi.

Along with this work attempts must be myle everywhere to enclose the fields with permanent. Enness of firtyn' (milk hash), firtyn er and such others hittle by hittle every year. This work can be economically done in the slack searon in the moreous following the transplanting of rice. This will prevent the necessity of erecting the expensive annual fences for the protection of crops and thus increases the margin of profit from them. This is not a new thing in this district as there is a regular system of enclosing the fields by fouces of milk bushes in the Alikag taluks and in pitches elsewhere and this may be very well adopted by the rett of the resole.

The creeting and the keeping up of these forces form a part of the permanent improvement in the land, which cannot be expected to be done from the temporary tensants without substantial help from the owner of the fields. As many of the members of the associations are had owners, they should first of all commence this work on their own lands and noduce their neighbourt to follow them.

These are some of the lines of work which the Associations formed in this part can adopt and commence work as early as possible. The writer will very gladly supply with any information on points mentioned above and also with see is a far as available.



GOKAK FALLS.
(F. Ag Tour)

## The F. Ag., Gcological Tour

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### Henry Van Buwren

This often been said that the delight of pleasures anticipated exceed the delight in the pleasures themselves; that this is not of universal acceptance could be borns out by an students who never anticipated such a pleasant time as we had on our tour. Possibly, the acceptance of the acceptances on former tours, greatly exaggerated and then veneered over with a few facts might have prejudiced our imaginations, or it may be that we were sceptical as to the grandent or scenery that was so now home since the mind ever loves to relegate all that is beautiful to the ultima thate region of remance.

To write on the benefits derived from the tont is well-nigh impossible. They can only be very approximately gauged. There were the benefits moral and physical, as well as, intellectual. It gave the best opportunity to engender that camaraderic spirit without which a college could be hardly worthy of that name. Then Irieadships were strack, elf-opinionated outlooks were broken down, narrow-minded views gave place to those more broadened and laberal; more than one found worthy in another where worth was never expected. To these benefits must be included these physical. Now no longer does the mill loom up in the montal horizon as anguestive of a tedous distance. Muscle, one finds, does not tell so much as grit and determination. The will to do was ulways more than balf the doing.

The intellectual benefits cannot even briefly be enumerated because each one had much that would be possible to oneself, for the same reason the writer trusts that the personal factor whenever suggested will be personable.

The navolty of studying Naturo apart from books, was perhaps, the feature that appealed to all. Nature presented itself in all its bewildering diversity and challenged as, uninitiated as we were, to read her riddle of underlying simplicity. As one observed and studied, gradually and almost imperceptibly the mind catalogued and labelled phenomens in general laws which came home with redoubled force as

we recalled them from the eide-liaed, underlined,—in short, disfigured,—proges of one's text-book. Sometimes, as we progressed, we were dismayed at finding our generalizations to be only slightly extended particularizations. This walearst caution in documatising.

Our first half was at Gokuk. Here the eyes long sere with trap and onlying but trap, were refreshed with sandstone with its berutility parminted and stratified bands. A party of statents who preferred visible proofs to faith, led by Dr. Mana and Mr. Sahasrabuddle, made tracks parallel to the river to find, if possible, the place where the trap overhes the Sudstone. Although undisputable proofs were not found, still ori lences were forthcoming to validate such an assertion. The fulls near to Gokuk are majestic. One fear to attempt any description, a photograph is inserted in the magazine, even this does not at all engest its myestic grandenr. The wild native scenery is not only worth secting but also worth going to ecc.

Belgnum impressed us with its laterite. Its decomposition from trap afforded a good problem that has still to be satisfactorily solved.

Londha give us gaciss. The grand forests gave ample scope for rambling; many forgot they were geologists and would botanize on overy strangs and beautiful flower, fruit or plant. Some thought themselves pioneers and so they might have been when they had for their quest the naknown.

Castle-Rock etill greatly kindled the adventurous spirit, nearly overyone felt, to a greater or less degree, an instantion to ramble into every unvivited acok and corner. This reached its climax when led by one of our more daring and fatrept axplorers we lest bearings, then we had to consult our compass which showed a way down a steep descent into a river valley. There are still some who had not forgotten the gantle art of cliding which they learnt that day, added to this we had to ford the river in starlight. Then followed a climb through prickly shrubs and recepors through which we had to interally feel our way, sometimes on all fours.

The trudge to Dudhsagar from Castle-Rock is considered by many as the feature of the trur. Geologically, it certainly was most interesting, the shales and cohiets are of infinite variety, it was with reluctance that we had to throw many specimens away because we could not carry thom. The falls at Dudhesgar lose most of their impressiveness

by bring broken up into three main portions. In selecting adjectives to describe it, one would prefer beautiful and spleadid to those of gorgeous and grand which latter more befit the falls of Gokak. Still the Dudhsagar falls are yet in its infancy and one wonders whit it would be like in a tew more thousand years, that it would easily rival the falls at Gokak is not merely a matter of wild conjecture.

Dharwar was the next place visited. Some would have thought that the farm came as a rada reminder in the midst of our engoyment that we must not forget we were going to be agricultarists. The neatly kept farm with the experiments so carefully led out filled one with indirection for the scenes that could be things so methodically and systematically. Many never forget that they had come on a goological tour and it is to be feared that as our courteens Superintendent took such trouble to explain the experiments, some would took round and scentring a specimen, the whasper would go round, "I bemaitiful quartrite"!

Sunday was spent quietly in Gadag, here Dr. Mann addressed a few of the students who wished to hear him. The rominitie surroundings with a thoroughly agricultural background still lingers in the memory with which one will always recall the words of help and courage given to us in our bittle in this life to be men in the truest sense of the word.

The next day we continued our geological explorations, getting, here, rocks correlated with the Dharwar system.

Bagalkot had fresh interest to us, as we got limestones of various colours. Those who, led by Dr. Mann, climbel to the top of a hill in the neighbourhood will never forget the view at give of the whole country and afforded as it were a key to the rocks found in the neighbourhood. Stretching far on the one band, one saw the trap area with its black soil and dead level country. On the other and, one got the limestones, quartrates and a curious trecciated conglomerate which suggested metamorphism through the heat of the lava flows which was contignous to it.

Bijipur was the list place visited, here we combined archeology (or whit we thought wis so) with goology. An interesting find of punice stone on a small hill created great interest, it afforded con-

clusive proof that we were on the latest of all the lava flows, and confirmed the theory put forward for the secondary deposition of calcite in large pockets which characteristed the railway cuttings through trap. Space forbids mention in detail of the hospitality we met with all through the tour. The concert held at Bijapur on the last night of the tour was a fitting finale to everything. Here it would be but right to express our thanks and the deep debt of gratitude we owe to Dr Manu and Mr. Sahasrabad the, As the people of Bigapur did enlogise Dr. Mann and his work and garland him, we students felt that our appreciation might as well he shown; it took the form of the real Britisher's appreciation and as we shouldered him to the strains of "He's a jolly good fellow". It can better be understood than described that none would have dured this liberty had they not forgot the Principal in the discovery of a friend. Mr. Salasmbuddhe, we remember for his kindness, ever ready to explain any difficult phenomena and even repeat it to every student who would ask for a repetition, however annoring and disgusting constant repetition would be to him. His patience and tolerance compled with his sympathy will be very hard to forget.

### The Agricultural Tour 1912

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#### One of the Party.

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MADDESEEMS the student of agriculture if he ever has an ugly with a castomer to deal with, it is the book-taught philosophet whose mind is fillet with nothing but what Goldsmith expresses as the "unigar errors of the wise". He has, more thru all, a journey through ble-tox which besks alone cannot, qualify him but may rather by the cause of his blundering on and finding himself very soon undone. A budding agriculturist needs the qualifications of a St. Thomas who would not believe but he had seen with his own yes and touched with his own hands. It is difficult to explication upon a be not like to the saint, but it is undoubtedly true that the seed of expectation sown by every present B. Ag. student the moment he crossed the

S. Ag. by awakened in him, as each day brought him nearer to its blosom, an ever-increasing leave to go on the prescribed tour as far and wide from his present Decein hime as the sinc touch pure would allow and time primit. And hence on October 14th we left. Poons for the dust and din of other cities, to see other soils and those enumelled with flowers different from our own and later also to cuter those primeval forests, becent whose silent shirts, Gol's dumb creatnes still lurk in savage freedom, and in wondering contemplation to pass through the varied and rich profusion of the vegetable kingdom, its creations lying mineled in apparently wild yet beautiful confusion.

Our course as outlined after mature and mutual diliberation included hesites the importal stations, so well described in the accounts of past tours, a run through Kuthiawur and a cycle ramble through the erer verdiat woods of North Kanara. A stally of either has been sketched under special heads by abler hands than mine, and I will therefore pursue only the happenings of that time when we were long absent from home.

It was not without misgivings on the part of the authorities and fall confidence on our own as to the tension of our nerves for the fulfillment of the varied programme that address and bye byes were exchanged before the train steamed away. After a tew boars' stay at the Veterinary College in Boarbay where we turned our hands seriously to that important branch of our stinless "Boarma Pathology," we quitted the shores of the busy city for Verawal where the Sažarmati's paddle and screw brought us in safety over—thanks to the elements—a smooth sea; for once land was quite out of our sight and all around a glorious mirror, seemingly boundless, endless and sublime.

At Verawal we had just time to saunter through the maze of many streets watered with limestone and to gize in our passage at the tall white buildings so close to each other. To the people, almost all of whom appear to be Mishomelius by religion we seemed a heterogenous set of curvoities let loses from some zoo and neither our thristy looks nor the jurgle of our purses would induce them to overcome their scruples and admit us to their test-shops for a cap of that refreshing beverage. We took train at accord on the Juangi in State Ruilway and sped through country with a fuir calityation of jowar and cotton in general, and having the Gir forests looming in the distance. At Rajkot, we stopped in the evening and after a late support and a few hours'

nap, we were up again and on our way very early over the Morri Railway towards Wiramgaon. Outton along this tract looked better than on the Junagadh sile and the shandauce of grass all along in this sandy region proved a marked contrast to the lareness which always meets our eyes in the Decran. Peafowls and pelicans could also constantly be seen on either side of the line. From Wiramgaon, after changing from the not over comfortable metre gauge to the hroad gauge of the B B. and C. I. we came in about an hour and a half to Charoddi where the Kankreji breed of cattle in all its purity holds majestic away on the wast breeding firm. The system of sorting and isolating of herds according to age, the careful management needed and the extensive area of the farm give us an idea as to what it means to keep a good hreeding firm. A practical demonstration on the saying "There's many a slip between the cup and the lip" was also given by one of the tourists while strolling over the area banded for noe calitration.

From here we moved to Ahmedalad where many a Paul Pry in trying to examine the besuttes of the drains at the savage Pamping states got his olfactory nerves so thekled with some refreshing odours that he thought the whole of Ahmedalad was aprayed with the scent and had it likewise possibly by process of absorption—in its vegetibles and fruits. The black savage water on the farm mide as wish for an improvement on the present system of sewage application to the crops which showed dyspeptic symptoms from excessive feeling. A visit to the cattle market in the evening proved very instructive both in the discrimination of various breeds and the methods of buying and selling. Many of our men would fain have put their veterinary knowledge to practice here had they tow and powder and lotion to hand

Proceeding to Nadad, the kairs kedra mixture mixed as up into a consistency of the relative ments of mixtures and rotations. For want of sufficient run, the tohneous seeing grown under irrigation. Instructions were kindly given on tobacco curing and sericulture and later we were treated to a hearty tea by some of our old friends whom we were right glad to meet and to recall pleasant memories of happy hours spent in company in the College.

The same evening found as at Baroda, where being no longer "cabined, cribbed, confined," we let ourselves loose till the following evening, which was a Sunday, in the wide and splendid thoroughfares

of the city. One can imagine what all we saw when I say that late on Sunday evening several were heard to dream aloud and tell their friends for far away in language most elegist and choice the hearty and worth of the Public Gardens, the Museum, the Makarpura Palace and all else that Baroda had to show them. The Dussera procession with all the pomp of State was a long feast for our eyes till we longed for that other feast which we know was in the making in the Baroda College grounds. And right heartily did we full to it with larish thanks to Mr. Rajo for closing with a royal report a royal day spent in a royal city. Possibly the dreams were the effect of this, for in some quartor of the carrages at dead of night were also hourd words running high on the ments of ter and cofice.

With the rising sun of Monday we were again the old hunters after farming lore and at the farm were shown virious experiments on cotton and tobacco. The byri crop, though we were told it was poor this year, was decidely superior to ours.

At Surat, we proved, I am afraid, a bit too tromblesome to Mr. Gnivbbini our genial bost. Wn hud two days on his hospitahlo farm and not a moment but he was ready with a smile and practical answer to our questions and cross-questions. Drainago, interenture, straight sowing, gurden crops and their economics were interesting stadies here, yet too many to be done in two days or described in a few lines. Wn left the place with great regret, invoking blessings on our kind friend.

Coming to Dhalia, the size of cotton made as believe and eyes were suddenly turned small sighted in consequence of the heat of Gazerat. Things looked drear and patchy all arouad, and we were glad to be back again on our way to Foons on the 26th afternoon to start anew for the southern trup. As we came towards Nagur the sky looked sallen and we were glad to see signs of good rain all the way. At Foons we learnt there had been almost an inch and a half of rain that day.

The Southern Mahratts country wore a much greener aspect than what had hitherto come to our view. Hakeri Road was the first stop, on the 27th evening, from whem we ventured on our cycles, which now accompanied us, to visit the Gokak Falls. The next morning the cycles took us to the farm where we saw among others the salt washing and irrigation experiments. We noticed also cotton sown mixed with

chillies. Mr. Bhandiwad told us of his successful attempts in the extermination of pigs which were a source of great nuissance to the sngarcane crops. He was again extremely kind to us and we owe him our succere thanks. Ou the 29th cressing we were for a few hours at Belgrum where Mr. Kangle gave us a short dissertation on rice cultivation and varieties in the district after helping us to the discussion of same choice delicacies which he and Mr. Mallishli in all kindness had bustly prepared.

At Dharwar we were busy with pencil and note-book from 9 a. m. to 12 noon, taking notes on rotations, tillage, mannes, co tons, jowars, seedrates and many other things besiles, till we were invited to regale our inner man-thanks to the kindness of our past friends at the College. Bijic's plought which hitherto we had only seen in illustrations was shown to us in the evening, after which Messrs. Bendigiri and Inamdar were at home to us at Mr. Bendigiri's residence. The same evening we left the place and came to Haveri where the cycle tour commenced. That it was pleasant throughout is unimpeachable and if ever we had reason to be ill conditioned or crose grained like Gibriel Grub it was only at the end of our first thirty mile run when we arrived at Hingal and found that it would be several hours before our kit came up, and that we would have to make our-elvee comfortable that night mader the roof of an otherwise open building by the side of a tank. But we learnt from this how to avoid such extremities and rolled smoothly on over the smoothest of roage to Sirsi, Siddapur, the Gersappa Falls and Gersappa town. The spice gardens at Sirsi were worth all the trouble we had taken to come and see them. To the awner we can never he sufficiently thankful for all his interest to see that we were comfortable, and for his clear explanations on spice gardening which manifested his deep understanding and practical indement and experience on the subject. The Siddappr gardens were not on a par with those at Sirst. There seemed to be wanting a good bit of that care which we saw was being given to the Sirst gardens.

At the Gersappa Falls we had a real holiday. We had a view of the falls both from the Bomlay and the Blyore sides, and ventured even to fathom the depths where we were caught in the eternal rain of the place. From here we rode to Gersappa town over about a six mile

For his article see page 154 of this number, † See Mr. Keatinge's article in No. 1 Vol. IV.

ascent and then through as miny miles of a continual descent. It was a relief to in all to meet at the town and to find that we had done the whole journey seatheless save for an occassional panetire or a fright at the sight of a parther in the distance which we were told in one instance made one of our party cut a sorry figure by having to run for dear life with transers half downed. At Generappa torn we took boat for Honawar where Mr. Burne's mingo juice factory was an interesting study deserving high commendation. We are greatly in leb'ed to his sincere kindness to in and cannot but with him success in his great venture on the canning of mingo juice.

From Honavar the steamship Netrarati brought us back to Bombay via Mormugos though not as smoothly as we might have wished.

The success of the whole tour is beyond dimbt. We have learnt from it lessous and experiences which will over remain imprinted on our minds, and we are deeply in lebted to Mr. Knight for the patient kinduces with which he led as through overy item of it and not less to Mr. B. B. Patel who also accompanied us.

The illustration which shows the Cyclo Brigule reminds me of Mr. Golbols who did excellent work with the cumer; taking many and beautiful views wherever he could. We should be much obliged to him for copies of the views which would serve as mementees of one of the pleasant times we have had during our term of scholarship at the Agricultaral College.

## Spice Gardens at Sirsi, Kanara District.

BY

#### Felix J. Fernando.

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The cultivation of spices has been one of the most interesting and interestive stallers of the final year students of this College while on their recent Agricultural tour through the southern part of the Pre-idency. This cultivation is not found elsewhere in Rombay, and hence was quite a new crop to most of us who were from the Decrun. They form, however, an important article of commerce in North Chara where the natural conditions favour their growth, and where they can be grown with lattle trouble and expense. The rainfall of Sirsi in this district is about one hundred and twenty inches per annum, mranged on the average as follows:—

#### Average Rainfall in inches.

January February March		1.57
April	•••	•
May	٠	2.46
Jane	•••	24.88
July	•••	36-23
August		20-84
September	•••	6-99
October	•••	5.53
November	•••	1-11
December	•••	0.42

Total... 100-03

One of the most important considerations in the cultivation of Spices is the selection of land for the purpose. The most suitable lands are valleys or hill sid-s where percentil me'ss run. Háving selected the land, plantains are thickly grown to serve as a shade crop for the main crops which are Betelant, Cardamoms and pepper. The cultivation is started with the transplanting of betelunt which is at first sown in nursery hels. When three years old, the betelunt seedlings are planted at a distance of twelve feet apart among the plantains. When transplanted, the seedlings are about four feet high. The transplanting of the betelunt seedlings are about four feet high. The transplanting of the betelunt seedlings is done in circular lats. Puts two feet in diameter and eighteen inches deep are dag out and leaf-mondél in nuine to gether with plurain stem refuse is allel to it, after which the seedlings are put in Tho leaf-mondél manner is prepared from the leaves fallen from older betelunt trees. Eight years after transplanting, the betelant trees begin to beir when a second batch of seedlings is transplanted midway between the mature trees so that there are mature trees and seedlings alternately at a distance of six feet. The plantain trees are gradually thinned out as the betelant seedlings are put on in the field. The betelant trees live for about fifty to sixty yours but it only pays to an ago of forty years.

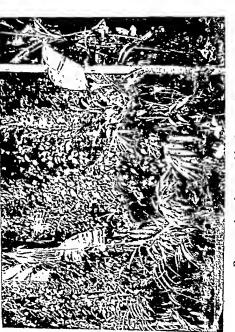
Cultication of Cardamoms.—If the plantages provide a very thick shade the cardamom seedlings are transplanted at the same time as the betelant otherwise they do not thrive. They are propagated in nursery seed beds.

The size of the seed beds which are usually made is six by ten feet. Fresh, well grown, healthy, mature, green cardimon seeds are used for seed parposes. The seeds are mixed with sales in order to remove the sweet gelatinous coating of the seeds before draing to prevent insect attack. The seeds are broadcasted in September, two mosths after which they germinate. After be 'easting the seeds, plantain stems cut into two are spread over them to provide heat and shade. A month later (in October), the plustau stems are removed from the seed beds and Actala ( Phyllantains Emblacus) leaves substituted in their place. A month after this (in November), the seeds begin to germinate and the young seedlings in the other way through these leaves. If germination does not take place a little hot water is spil kled over the seeds to stimulate them to growth. The seedlings are left in the bed till four months after germination that is to say until the following March.

In April, the seedlings are transferred from the seed hed to a nursery bed and left there for a year. In the nursery the seedlings are sown on ridges at a distance of eighteen mehos apart, water heing given when necessary and shale provided. The nursery should be provided with good dramage. Fourteen months after sowing the seed that is to say when the seedlings are one year old they are transplanted rate the permanent garden hetween every two betchust trees. Streteen months there, they hegin to flower, the buring season using September to December. The fruits appear in punicles just above the ground. Formerly, when one set of seedlings were trusplanted there was no necessity of preparing new seedlings to take the place of the old ones as the young suckers developed new plants. But now owing to a disease called the "Karbh" Decesse which has not yet bern investigated, new plants much be just in place of old ones about ones in every four years. Nothing is yet known shout the cause of this disease.

Perper Cultivation.—Twelve years after betelouts are transplanted into the permunent graden about three or four mature pepper vine cuttings about six feet long are planted round the base of the betel palm, six unches deep in the sed, and are tied to the pulm to prevent them from fulling down and to help them to climb. The rouson why the pepper is not planted either is because the stem of the hetel palm is very green smooth and slippery and hence, the pepper cuttings cannot have a firm grasp of the stem to climb. Therefore they have to wait till the stem becomes quite rough and thus enable the cuttings to grow and climb easily. In some cases the vines are first make to trail along stacks, then they are cut and inserted round the hase of the pulm order that they may grow easily newards. Seellings from seed, are, as a rule, not grown because they require more time to grow and live for a shotter period than plants from eattings. The cuttings are planted in Max.

Drains are made at a distance of twenty feet apart being two feet deep and nine inches wide at the bottom with cross drains to secure good draines. During the hot season enhances are made for irrigation water to flow through and the water percolates and is carried to the roots of the plunts by capillary action thereby preventing the roots from being water logged. This system of irrigation is highly satisfactory. The gardens are watered twice a week from percentil nalss running down the hills by the sade of the gardens. Some gardens require writer daily. As the ruinfall is heavy, large quantities of soil are nounally washed away from big arlens. The soil thus lost is replaced every alternate year by soil from hill sides. With regard to water, one point must he remembered and that is that water which is puddled and full of silt will not do fort by elicitate plants.



Pepper and cardamom cultivation at Sirsi.

The leaves used for manning are brought from the surrounding forests, every cultivator being given nine acres of forest land, free of rent, for collecting the leaves, for each cultivated acre. Vast quantities of leaves are brought from the fore-ts and put under the cattle to absorb the unne, fresh leaves being supplied at intervals. The gardiens are levelled and munural every alternate year. Broken leaves fallen from the betelant trees are removed frequently to prevent the cardamon plants from injury. The gardiens are weeded twice every year. Six mannds of Farmyard manne (28 lbs. = 1 mannd) are given for every two trees of betelaut (c. e. one old tree and one young one). Out of this, a little manure is used for cardamon and is applied when the betelants are manured.

Outturn.—There are 500 betelout trees to the acre, and the outturn of shelled and dried betelout is on an average about two kindies or twenty manula (560 lbs.) per acre. An excellent crop may give even two and a half kindies. The price of nuts is very variable and ranges between twelve annas and a rupee per manula (28 lbs.). It fluctuates very much and may go up even to three rupees.

On an average eight maunds of dried black pepper can be obtained from an acre. It is sold at eight rapees per maund, and thus gives a gross income of about sixty-four rapees.

Cardamonis give on an average about two mannds per acre and they are sold at sixty rapees per mannd thereby giving a gross income of about one hundred and twenty rapees,

It must be remarked that the cultivators are very economical and fully realise the value of manure and organic matter, and hence make the best me of every little bit of manure and urine that they get hold of. The preservation of urine is a great contrast to the wastefulness of the urine in the Deceas. Still more marked is the efficient method of irrigation by capillary action and the application of water and manure, not by a hard and fixed rule and in large quantities but as much as the plants require and when necessary. The methods of cultivation are very efficient and highly estisfactory. An investigation into the cause of the disease which has recently manifested itself in the Cardamona is very much desired and will undoubtedly prove very useful to the cultivators.

# College News and Notes.

FARE this number reaches our readers, the year 1912 will have run in its course, and we shall have commenced a new year of hope and expectation. We tender our best greetings for the New Year to all our readers, to our staff and not less to our companions in study, to whom in particular our wish for all their undertakings in the New Year is: "Be bowled out or caught out but never throw down the bat."

The Social Gathering this year was damped by the unusual weather we had in consequence of a visit from the late rains. From the experience of past years in which the function, held in October, was usually marred by the rain, the date this year was poned as fir as possible from such a contingency. But it broke our epirits not a little to see that we were in the milst of beavy rain on the eve of the Guthering. Not even the "chowghada" whose din resounded for miles around the College hall seemed to entice the san the next morning from out of his concealment. The programme of sports and games for the day had to be postponed sine die as the weather report showed little likelihood of un early break in the existing conditions. However, owing to the presence of a large number of exstudents some of whom had come from a great distance for this great oceasion, the evening was employed in a friendly intercourse between them and the College Staff. The idea of this move which has originated only this year is an excellent one and gives all past members of the College an opportunity to interchange opinions which must result in some good, both to the College and those who have had their education there. An account of this reunion is published elsewhere in this number-

On the morning of the 23rd the sky wore still a threatening aspect till at nine O'clock the sun gradually unveiled teself and instilled at once mo'ail, a sudden wigour, to begin the sports as soon as possible and to get through us many items of the day's supopment as time would allow. Accordingly, the sports were commenced at 12 noon and save for wrestling and swamming which were two of the most important events, but had of necessity to be postponed, a spint of activity and enthusiasm on the part of workers and competitors helped

every single event to be enected successfully. The competition was very keen as could be noticed in the exceptionally large number of entries for the games, and the winners muong so many deserve credit.

Sports done, the Hon'the Sir Justice Chundwurker, who did us the year thouser of presiding on the occasion, after a string address full of sound and printeral advice, gave away the prizes which stood in beintiml array before him. The many entries and the hearty respond to the appeal of the Sports-committee for kindly docutions and lied the latter to make an excellent selection of valuable presents, which included also prizes oilored by the general secretary for the gathering, the chitors of the Magazine, and the Fernando brothers. Mr. Lumidar deserves our special thanks for working most energetically to make the prize-gating an absolute noreity and success.

The evening would up with high retreshments and drimatic performances in Loglish and therein. Both were interesting and thep in also died it ill malight. The English programme medided a humorous sketch "The Mutton Irial" and a very original and amusing display of hing parties cuitled "Dr. Fluorgon's Bioscope" by Mr. T. C. Drieberg. The Red C. the clarge of the Light Brigade, the feat of the great Ceylon Herenles in having a motor run on his chest were among the items which kept the house in rours of Lingdier. Our Ginaruti friends were also well up in their noting and Mr. Bhatarkar particularly cut a good figure as the empty dualy.

On the following Monday, the Maratha play which was to have been put on the loands on Traday was acted, before which Prof. Shukha gave us a display of his powerful memory. The play was a trague one and I tradk it is too little to say that every one, especially Mr. Godbole, did his part most naturally.

With this however, the Gathering did not end. The swimming and wrestling competitions which were kept aside were held on the 7th of December at the Kitkee Quarters, where before a large conceins of the December at Mr. Missnif (senior) easily field low Mr. Almo in the senior round, and Mr. Prabhane came off best in his tassfe with Mr. Mindke. Mr. Mandke however made ap for his defeat by winning the swimming race.

At the General meeting of the staff and students on the 16th of December, the prizes for these last events were given away by Dr.

Mann, and also to the best actors in the different performances, among whom were Mesers. S. R. Godbole, Drieberg, E. Fernando, B. J. Patel and Bhatarkar. This latter set of prizes was kindly offered by Mr. Ranade of the College Research Laboratory.

At this meeting there was also presented to lino Sabel Kelkar, who recently left the College on long leave, an address of farewell by the students. Ino Sabel Kelkar has been connected with the Agricultural department for over twenty-five years and his uniform energy throughout and his affilible kindness to the students deserved much more than the little that we could give him. Ilao Sabel Kelkar replied in fitting terms to the address and also gave a bit of practical advice to the students which was received with cheers.

At this meeting which will probably be the last of this College year also appointed the whole staff to be judges in the awarding of the Ahmed—Mann metals for 1912-1913. The procedure for the selection of the most public-spirited student in each class is to be the same as last year except that instead of five members of the etall, the whole staff is included in the committee for the final selection, the suggestion was made on good grounds by Mr. V. G. Gakhale and adopted by the meeting. The names of the medallists will be published in the next users.

Dr. Mann closed the proceedings of this last general assembly who no of those rare sermons of his, which will make even the most desperate and despairing feel, that life is worth living and that there is something for everyone to do everyday of his life in this world. He also thanked Mr. Golbole tha general secretary for the Gathering and all who helped him to make the Gathering as enjoyable as it had been under the streamons circumstances already mentioned.

It gives us great pleasure to note the appointment of Mr. Amrithal C. Dessi L. ag. as Agruedturel and Industrial expert in the Indore State. Mr. Dessi passed from the College in 1904 and after cerving till 1907 in the Bombay Agricultural and Imperial Departments went on tour throughout India having obtained the Hundu Education Scholarship for sugar. He studied the sugar problem and wrote a report on his studies. Later he went to America where he undertook the study of the eigar industry, including the refining of sugar. He also took ap the course of Agricultural Economics obtaining the M. A. degree

from the Wisconsin University. He returned to India last March and we have reason to congratulate him on his important appointment.

Mr. G. N. Sahasrabaddhe who also went out to study the same sniplet in the West Indies as a Government of India Scholar returned to India in September and we should be glad to see him well appointed for the experience he has gained.

Mr. P. C. Patil, Inspector of Agriculture, C. D, who was sent to Europe by Government to study the Agricultural conditions and organizations in different European countries is again among an now, and we should be glad to see our country improve by the wide experience he must have gained in foreign Agricultural countries.

There is very little to be said for the various departments of the Gymkhana except for Tennis and Hockey. The Tennis tournaments were a decided success and we have pleasure in giving the names of the champions. Hockey matches have been played, we believe, more often than the cricket matches were ever played and lately our team was able to defeat the European Police Team.

The Middlesex Regiment also met our team in the field when some fine play was shown on either side, the Regiment according just one goal at the very last moment of the game.

Our men also expect to meet a team coming from Allahabad during the X'mas vacation. We hope to furnish an account in the next number.

The Debating Society closed its session in November after finishing the programme laid out by the coergetic secretaries.

# OF

Books, Journals, Bulletins &c., &c. in the Library

LIST

OF THE Peess Agricultural College.

## List of Books, Journals, Bulletins &c., &c. in the Llbrary of the Poona Agricultural College.

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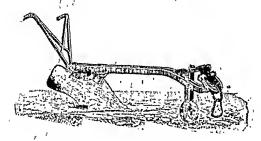
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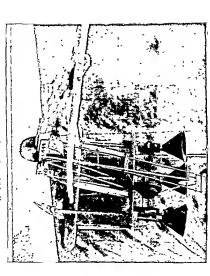
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# The Poona Agricultural College Magazine.

### Editorial.

HE present is the concinding number of Volume IV of the Poons Agricultural College Magazine. The volume is larger than any of those previously assued, and we do not think that the contents will be found inferior in interest or value to any of those which have preceded it. When we turn and consider the humble way in which we commenced four years ugo, with the tentative issue of two half yearly parts, and now look at the large circulation which the magazine has reached and the amount and value of the contents we can hardly believe that the change has been effected in four years. The re-ult is due, of course, to the way in which the college staff and past students have supported the venture and have placed their experience and observation at the disposalof the magazine, coupled with the energy and enthusiasm which the present students have given to its management we venture to bope that the high water mark is not yet reached, and that the ideal of the magazine-to be a high class ogricultural magazine for Western India will be still more perfectly realised in future years.

The present number contains a number of specially interesting nrticles, and, as is always the case with the number issued in March is almost entirely composed of contribution from ontsiders and past students. We would first of all draw attention to two articles an what may be called 'agricultural argumention'. The first of these, on 'Agricultural Associations in the Docean' is by Mr. V. K. Kogekar, who has bad unique opportunities of studying the subject and speaks out of the fulness of a very intimate knewbedge of the subject. He has been for the past eighteen months organiser to the Docean Agricultural Association, and his duties have been to travel about the country, visit local associations of every eact which axist, suggest to them lines of activity in which they could fruitfully epond their energies, and attempt to make such local associations of grather ass that they have hithesto been

He has succeeded greatly in his efforts,—and has won golden opinions both from the local associations, and from the central body in Poona which has employed him. His notes have, therefore, extreme value, as being the result of a first-hand and intimate knowledge of the subject. The second article on organisation is by an old friend, Mr. Udhyaver, the Anditor of ex-operative credit societies as Southern Marath Courty. He has in former days contributed a thoughtful and useful article on co-operation to our pages,—and his present notes will be found of considerable value and interest.

(locely related to the problems dealt with in the above two papers is the dealt with by Rao Subet G. K. Kotwal, —Cottago Industries under the conditions of dry land cultivation in Western India, —and by far the greater part of the cultivation is dry land cultivation,—a cultivator is bound to have a very large amount of time ou bis lands each year, and this would seem to give an opening for the developments (af profitable byepaths of industry. Mr. Kotwal has mute a study of n number of these. He has actually introduced data cultivation, and one or two other industries by his own efforts,—and his paper will be found of extreme value.

Mr. Mahajan, the acting superintendent of Manjri Farm, writes on the method of testing the ripeness of sugar-cane. The use of the Brix saccharenteer is, of course, known in every country where super-cane growing and sugar making is practised on a large scale. It is not, however, in use at all in the Deccan—or even in Western India, and, it utilised as described by Mr. Mahajan we are confident will make un unportant step in the improvement of the very important industry of cane growing and gwt manufacture in this part of India.

Other matters dealt with can be only mentioned. Mr Chibber continues his account of some plants likely to be of economic value with as Mr. Beale one of our present students, who is specialising in Botany—gives an account of some of his own very interesting work on glands in plants; and there are others.

In sending out the last number of the present volume, brought out on the ere of the despectace from the callege of another, quantizes, of statlests, we can only wish to those who are leaving us the lest that we know. May they by their high character, by their skill in applying to actual problems the information they have acquired and the methods they have learnt, worthly maintain the honourable traditions of the form agrantized Coloral control of the form agrantized Coloral control of the form agrantized Coloral coloral

#### Causes of the General Failure of the Oil Pressing Industry

#### the Bombay Presidency.

BŢ

Kapitram K. Vakit, B L., E. sc. Tech. (Man.)

The recently the reputation of the oil pressing industry was the property of t

In 1902 Mr. F. G. Sly, the Inspector General of Agriculture, published a pamphlet on the Cotton Seed Oil Industry; since then the problem of the oil industry has occupied a prominent position. Two more publications of importance have since been made by the Government of India. In 1907 the question was discussed at the Indian Industrial Conference, and from 1905 a number of attempts have been made to organise this industry on a better scale. Two or three new companies were registered. At this time several articles were published in the Indian Trade Journal ( Vol. VII ) on the cotton seed oil industry. These articles created further interest among the public, and led to the formation of some more companies. Unfortunately all of them proved abortive. Thanks to the efforts of Prof. T. K. Gajjar, the pioneer of Chemical industries in Western India, and Mr. Ralph C. Whitneck, late Economic adviser to Gukwar of Barols, Mr. Fredric Noel-Paton, Director-General of Commercial Intelligence, and Dr. Harold H Munn. Public fuith in the future of this industry has been maintained in spate of the above fulures. Prof. T. K. Gajjar in 1909 himself projected the Nas cit O.1 Maunfacturing Company Limited with a capital of Rs. 5,00,000. Part of the capital about Rs 150,000 was subscribed by the organisers and their friends, but the public had lost all hopes in the commercial possibility of the cil industry in India, and no more shares were applied for, althrugh every attempt was made to start the work of this Compray. Fully the whole concern had to be would up. Prof. Gajur hid also organised The Alembic Chemical Works lamited which received a site-factory response from the public whilst bis Navnit Oil Mannfacturing Company project had to be abundoned. My efforts were, at the outset of my investigations, directed towards finding out the cances of failure of this industry in Western India. As far as I could judge, out of the various causes that determined the fate of the indestry in its primary and experimental stage, the following may be given as the principal causes of failure.

- I. At its very beginning, unfortunately, this industry received the attention of an adventarous class of mra who had no eptetial knowledge or experience of it. Without proper expert guidance or experience they framed schemes with the belp of machinery agents, who knownext to nothing about the chemical and economic side of the oil pressing industry and the consequences of whose ignorance had to be home by the oil commanies which were formed.
- II. Acting under the plvice purely of machinery agents the early companies started with an uneven distribution of capital, paying prulaps to much for the mechanery and leaving too lattle for binkings, working capital, cuppleyment of chemical experts &c. In two instances in Gujerat we find that the concerns were started with a nominal capital or Rs. 100,000 each, of which only Rs. 60,000 were called. From this sum the machinery is reported to have cost as much as Rs. 50,000 for a plant to crash sixteen tons daily, leaving only a balance of about Rs. 10,000 for land, buildings, working capital, stores &c. Starting under such circumstances, however promising an industry may be, it is bound to fail.
- III. As the natural consequence of the above, in seven cases of ten, the fills had to be mortgaged from the very beginning, and if the originators and promoters did not possess sufficient influence they had no facilities even to borrow money to meet working expenses. Special stress must be laid on this point.
- IV. Mr. P. R. Chaudhri of Calentta in his paper on 'Oils and Oil Seeds,' read before the Third Indian Indiatrial Conference drew our attention to other features; he remarks, "It was also then that I came to know of the deplorable correspicted policy of these mill-

owners, the faulty economic basis on which some of the mills were managed and to some extent, the regrettable want of honesty." Dr. Lewknwitsch in his speech before the Indian Guild of science und Technology similarly remarks: "As another example, I might point to the industry of Edible Cotton seed oil. India, as you know, produces an enormous amount of cotton seed. The hulk of this is shipped to Enrope to he worked up there into oil and cake. This industry should be retained in India and an important industry might be created, if it were taken up in India in the proper manner. In Bombay actually some mills have been started; but look at the way in which this has been taken up by these apparently enterprising people in Bomhay. They first thought of the edible cotton seed oil industry in the United States of America, and because the Americans were successful they thought that all they required to do was to send ont n commission to look at the American Mills and to place an order for a large plant in America. Then the thing should work by itself. Unfortunately they overlooked the fact that the individuality of the Indian cotton seed ought to be studied; naturally failure was bound to come, as indeed it did come."

V. Some of the Oil Mills are equipped at random with Machinery entered to crush other varieties of seeds than their own particular requirement. I lately visited a concern which though established for crushing cotton seed did not possess a single piece of machinery that is required for the special treatment of this seed while they had a regular plant for treatment of castor and other seeds I have seen this instance even pointed out in a confidential Covernment report, on the subject. In some other cases I was surprised to find that mills were equipped with old or rejected machinery brought from England or elsewhere. In the case of a Bombay mill, which of course ultimately failed, I was told that the mungement had scarcely a day passed without some mishap or the other happening to the machinery.

Vf. There has been considerable ignorance as to the proper treatment of nil seeds and oils, and no small amount of difficulty was experienced in treating and refining the oils. At one of the mills I visited, when they were crushing castor seed, and did not, for some reason or another, get the proper colour and the proculiar florescence of the crude oil, they tried to remedy this defect by putting in the Palgeraumer a quantity of some barmless colouring material (turnerie) with the result that the merchants refused to buy both the oil and cakes worth about Rs. 20,000.

- VII. During the monsoon and to some extent in other seasons, it is very difficult to store crkes, as they soon go mouldy and get heated up. Thus they get considerably deteriorated in value, where proper measures are not adopted for their preservation.
- VIII. There is a very small local demand for cakes, and most of the cake is exported. This export basiness can palv he paying if it is placed in the hands of reliable men, as we have to deal with a distant and naknown market.
- IX. Rath and shipping charge of oil and cakes being very high some of the mills located at long distances from market or shipping port found financially impossible to bring both the oil and the oil cakes to Bombay which is their chief market. In Broach, Barola and other towns the faith of the people in the cakes and oil pressed in the native gluins make it difficult for the machine pressed cake and oil to find buyers locally.
- S. Again in places like Breach &c. seeds were not available in large quantities all the year round and they had to hay from the Bombay market. Thus they had to pay rail charges both on the raw materials and on the oils and cakes, for ultimately the whole output had to be considered to Bombay.
- XI. As regards the exports of oils, there is considerable difference of common, but the majority of them are convened as to the non-paying character of the export trade. Dr. Harold H. Mann and others inform me that the export trade in oils at present is not paying and any attempts to do so have met with failures. Five reasons for which are given.
  - I. High freight on oils.
  - II High price of casks.
  - III. Loss by leakage.
  - IV. Loss by absorption.
- V. Gross adulteration of exported oils by earlier shippers. I am convinced that nuless we can ship our oils in bulk as mineral oils there are very fewich nees of success in that direction.

As regards the loss by leakage and absorption I am informed by Messrs. Ransom and Company of London that if the casks are silicated or glaed from inside these losses can be minimised. The English and continental buvers do not like to buy Indian oils on account of the gross adulterations that were practiced by early shippers. It being easier to detect bud quality of seeds than an adulterated oil they prefer to buy seeds and not oils

- XII. The Indian farmer and cattle owners refuse to buy machinemake cakes for folder as the percentage of oil in the country oil cakes is greater than in the mill cakes. Though the percentage of oil in mill cakes is less, it is erroneous to suppose that these cakes are poorer in quality as feeding stuffs. All the same it is very difficult to fight against this prejudice of the farmers and we have to face the situation as it is,
- AXIII. As the export trade in oil was, in the opinion of many, a non-paying business and as there was a very small demand for cakes it was found that the extension of the oil pressing indirsty was limited to the local demand for oils for edible purposes and as lubricant. The Indira bullock oil presses supplied edible oils and there was very little demand for the oils obtained by machinery. In fact the supply increased more than the demand and as there are no industries depending upon the ntilization of oils, e. g., soaps, cudles, marginum &c. the newly started oil mills worked spismodically and consequently were commercial Lilines.
- XIV. Another serious cause of future was found in the growing demand of mineral oils for burning purposes. Itll the beginning of this century large quantities of vegetable oil were used for this purpose, but as these oils were dearer than the mineral ons their consumption was seriously checked.
- XV. On the one hand without proper knowledge and special experience the oil crushing mdustry was presenting inexplicable difficulties to the native India merchant, and on the other hand, shipping and financing facilities for the exportation of the raw material namely oil seeds themselves acted as a powerful undocement to our merchants and this brought about a further neglect of the otherwise important oil crushing industry. Special emphasis must here be laid on the detrimentage effect produced by prolonged storage of seeds and cakes in this country. It was always found safe to send them out of India, as early as possible. Seeds stored in the warehouses of the mills had considerably deteriorated and were found in many cases unfit for pressing purposes. Before

concluding this short paper I must mention here the particular case of the cotton seed oil industry. In its very beginning it had lamentably fuled as failure was bound to come. There was no technical guidance. no incretive market for machine pressed oils and the products like halls, cakes &c. Demand had to be created and in doing so reverses had to be encountered. Then character of the seeds bad to be studied and the refining processes had to be perfected. This was only possible if the experiment had been financially supported. Messrs. Tata Sons and Company are to be specially congratulated on taking up this in-'istry in the right and proper spirit and it is hoped that their experience will work as a valuable asset for the future of this industry in India. The Indian Cotton Oil Mill Company Ltd. of Navsari is also to be congratulated on having successfully terminated their experimental stage and on their desire and effort to place their Company on a sounder basis by increasing their original capital. Having taken into consideration the prominent causes of failure, I am optimistic as regards the future of this industry, and given technological skill, bounfide workers, facilities for commercial undertaking and organisation on right lines, there is no reason why this industry should fail, if the Government and the people continue in their efforts, as directed at present to develop, and promote this industry. I am sure we shall soon put a serious check on one of the greatest drains of raw materials from India, and establish a etaple industry which by right would belong to us in the future. New works for the manufacture of soap, steamne, glycerine and candle are started, and lubricants, boiled oi s and other oils of technical importance are now made in large quantities in India, and there are now sufficient indications to show that we have passed through the experimental stage, and all the local conditions appear favourable for the founding of this industry on a large scale, and if we direct our future efforts wisely hy our experiences of the past we shall have little cause to fear further failure.

# Some Experience of Artificial Manures in the Karnatak.

DY

#### G. L. Kottur, B. Ag.,

Acting Cotton Supervisor, Dharwar.

IN the Karnatak cattle dung is practically the only return that is made to the land in some form of farm-yanl manure. The dung is often mixed with pieces of kadbi in varying proportion and allowed to rot for some time before it is applied. A liberal admixture of earth, stones and refuse is not uncommon to meet the increased demand in recent years. The use of manage on the whole, is praking good progress in the Karnatak. The majority of the raigats now know very well the adventages of different mannes, and they generally do not fail to apply the right kind to their field if they can. But unfortunately the number of cattle in the country is decreasing. The price of ordinary bullocks has much increased and their maintenance has become very difficult on account of the high price of folder. Under these cirenmstances it is not surprising to see a good many cultivators managing their work with hired ballocks whenever necessary. All such persons have to purchase their whole supply of mannre from the neighbouring raivats usually at a high rate or remain content with what their impoverished soil returns them for their labour.

The results of manure are often imperceptible ic dry farming which is precarious on account of the meertain conditions of rain full. Excessive heat and numtion lead to the production from the rocky particles of the soil a good deal of plant food, which if there is no heavy rain to wash it out, continues to accumulate so as to support the growth of crops in a very remarkable manuer under favourable conditions. But the state of things is different in irrigation farming. Constant application of water nlone is sufficient to wash out the greater part of the fertilising value of the coil, necessitating thus the application of manure

in sufficiently large quantity before the land is again cropped. Even the crops which require the least mannre do not give profitable results without manure. The cultivation of sugarcane and other paying crops would be therefore impossible if the land is not well stocked with mannre. The cane growers of the Gokak Canal tract usually manure their crop with one hundred cart loads of farm-yard manure per acre in addition to folding sheep on the land. In this as well as in other irrigated tracts there will be naturally a good demand for manure and consequently the cultivators will have to go outside their own neighbourhood in search of it, undergoing thus a lot of trouble and the expense of carting the stuff to their fields, apart from the cost of manure. With all this they are not always fortunate in their bargain. They often find that their article is too poor to produce the estimated outtuen. The composition of farm-rard manure is very varying depending on a number of factors. To add to these, the beaps they purchase contain a lot of n-cless material purposely worked into them.

Working under these various difficulties the raiyats in mny part sittle ver remain under great obligation if their manurial problem is either solved or simplified. The efforts of the Agricultural Department to popularise pondrette and to introduce oil cakes seem to be credited with success. Experiments with various artificial manness are being conducted on many of the Government farms and elsewhere, and a desire has been created in the mind of some well-to-do land owners to give a trial to them.

But onfortunately the results with artificial manures are not quite satisfactory although their use is generally attended with considerable profit in other countries. The application of inorganic manures does not seem to add to the ferthity of the black cotton soil. The fact that these soils are much henefited by the addition of cotton refuse and town sweepings (which generally contain only a trace of plant food) demonstrates the necessity of improving their mechanical condution by giving a sufficiently large dose of some bulky manure rather than to concentrate their inorganic contents by the mixing of artificials. Experience has further shown that the results obtained with artificial manures on the Dharwar farm are to a great extent inconclusive or inappreciable.

The following statements show the effects of various manners on the yield and cost of production of the two important crops, riz. cotton and jowar.

Statement No. I showing the results of artificial manures on Cotton.

No.	Crop.	Manuro.   Yield of Kapas per   O   acro (average of ori   0   0   0   0   0   0   0   0   0
		lbs. Eq.A
1.	Cotton	Sodum Nitrate. 63 6 5 559 597 518 240 473 Thomanures are applied at the rate
2.	,,	Galcium of 10 lbs. of Nitrate. 92 9 3 543 528 499 242 453 Nitrogen por lacre in two
3.	,,	No lequal dress- ings half at Manure. Nil. 0499 588 538 278 476 the time of sowing and
4.	,,	Tarm-   half sizes   half weeks later
5.	,,	Ammonum  Sulphate. 43 1 13571 535 442 231 457
6,	,,	Cyanamide 66 8 4 616 618 568 263 514
7		85 10 10 599 601 472 203 401
	1	

<sup>.</sup> N. B .- Every plot receives 2 tons of farm-yard manure per acre in addition to the above quantities.

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No.	Crop.	Menure.	Quantity per acre.	Cost of the manuro.	Yie 1908 -09	ld of K er sers 1910 _i1	apas in 1911 -12	Average yield per acre,	Remarks.
			Ibs	Rs A,P.		_			
1.	Cotton	Super							
		? Phosphate		9 6	288	320	318	309	
2,	"	Potassium							
	1	( Sulphets		854	327	356	316	333	
3,	,"	Ammonium Salphate		1000	951	298	302		
4,	,,	( No	100						
	"	Manure.	Nil,		356	528	297	394	
5.	,,	Snper.							
		} K, so,	300-100	17 11 4	282	315	310	302	
6.	"	Super							
7.		( K, 50,	300-100	10 E	196	296	320	273	
1.	"	Am, 80,	100_100	1854	l PRA	907	801		
8,	,,	(Am, 80,				201	201	201	
		Super	100-300	  27 11 4	106	286	300	231	
		K, 80,	-100		}				

Statement No. III showing the results of artificial manures on Jouar:—

					١	١		1		ľ				١.	_	Average F
ė	Crop.	Kind of Manure.	Quantity per	-ti	Cast of the		Yield of grain per acre (average of original and duplicate plots)	Yield of gram per acre (average of original and doplicate plots.)	per a		Fer acre Average yield of	Yield (averaduy	Vield of Kadbi per acre (average of original and duplicate plots).	s per a rginal lots).	and and a	yield of Kalls
_	•		1	-2	×	- [ <u>.</u>	11-11-11 11 11-11-11 11-11-11 11-11-11-1	101 000	516 11	1	_ _===================================	00 500	1308 09 Page 101940 11 1111 121	2780 1650	1650	2657
-	Jowst	Sodium Natrate	N 63 lbs. 6	ت غ	10	i	1351 1112	=======================================	50 615	3 5		3750	3180	2 Grio	1648	2794
63	=	Calcium Nitrate	ਬ 	6	ო _	:		£ 8	3 3	225	98	3050	2500	3×00	1660	2252
e	=	No manure	<u> </u>	<u> </u>	:	ŧ	3	3	: 5	8	93	3150	2620	1875	1740	2346
-	=	l'arm-yard manure	2000 Ibs	3	1 1	:	15.71	500	302	230	2	1150	2530	2360	1625	2431
20		Ammonius Sulphato	<u>.</u>		=	1	0.21	- 60	: :	6	288	2730	2580	2750	1 725	1212
•	=	Calcium Cyanamide	8		*	1	î	200	; ;	3 5	55	9330	4020	2320	16 70	2755
-	2	Nitre	82	2	2_	į	1550	3	3	3	:		į		1	1

N B —The manutes were applied in two equal derssings half at the time of sewing and half arx weeks later.

than the latter.

From the figures of yield in Statement No. I, it will be seen that the farm-yard manure is second to Calcinm cyanamide which on an average has produced 22 lbs. more of kapas at an increased cost of Rs. 6-4-0 per acre. Thus there is on the whole a loss of at least Rs. 2/- in the nett profit per acre of the plot treated with Calcium evanamide as 22 lbs. can only fetch Rs. 4/- at the most. The use of other artificial mannes is not promising as their average outturn is helow that of farm-yard manure and their cost (in all cases) higher

list. But there is an indication that if the experiment is repeated for some years more the yield of no maunre plot will rapidly decrease and artificial manures may in that case show favourable results. Even then it is to he seen whether the increase in yield will be proportionate to the cost.

In Statement No. II the average yield of no manure plot tops the

In the case of jowar the results are not so discouraging. The application of artificial manures has resulted in more or less increased ontturn of both grain and kadbs. But the increase in all cases is not sufficient to give a corresponding gain in the nett profit.

Now turning to other crops potato and sugarcane whose manurial requirements are generally supplied by the cultivators in large hulk we arrive at nearly the same conclusions.

The following statements summarize the results obtained in the

case of these two crops :--

## Some Experience of Antificial Manures.

Statement No. IV showing the results of artificial manures on Potato at Belganm.

No.	Crop.	Manure.	Quantity per acre.	Cost of the manure.	Xield o per s 1909	ere	Average.	Remarks.
	Potato.	{Farm- yard manure	15 cart loads	Rs A, P,	1	163. 16700	. '	
		Farm yard Am, SO,	9 carts 1 cwt.	20 2 0	13040	16760	14900	
		Farm Am, so, K, so,	9 carts	20 7 4	12120	16630	14375	
		( super		23 10 0	12930	17110	15020	
		Farm super K, SO,	9 carts 1 cwt 1 cwt.	23 10 0	12020	16430	14225	
_								

N. B .- Farm-yard manure was applied in May while the artificials were applied in November at tha time of planting.

fucreased net profitorer Frem yard.	-	;	6 gain.	4 17 12 10 galn.	& gain.	7 6 1054.
fucreacd net profitor	-	:	80 12	=	28 0	8
	-	÷		<del>-</del> -		<u>.</u> _
Increased value over l'arm yard per acre.	-		:	<u>.</u>	;	:
Incre alm arm Per	-	- <del>:</del>		+2		23
	!	:	126	76	<u> </u>	-
4 4 5	-	<u>.</u>	<u>:</u> -		<u>-</u> :-	
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A P T	-	-ਨੂ—	<u>.</u>	<u> </u>	<u>8</u>	202
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hield of gud 23 3 per fere of the per fere of the o	=	5123	3 10 2245 6816	6 7910 6925	A595 6915	144 11 10 6970 6100
werd and de	ŧ	2450	5 K	7910	A593	6970
- A .	-	<del>-</del>	2	9	Ξ.	2
Cost of the manure	14 Me.   P	12	•	١-	22	=
	E	26	22	22	93	77
Quantity per acro		29000 lbs. + nil 26 12 4 7490 5125	20,000 +150 Hs	Fym + Saff cake 20,00016s +75 85 + Ams 80s 15s. of N + 75	20,000 lbs. of N 150 lbs. of N	Frui+Am2 SO. 20,000 lbs. 4 +K2 SO. 150 lbs. of N+
No. Crop. Kind of manuce, Quantity per acro		Farm 3 and	Fyna + Saultoner 20,000 + 150 Hs 72 cake of N	Fym + Saff cake	Usm+.1m, 50.4	Fym+Am, 50.
Crop.		Sugar		=	=	:
ģ	-	-	es	40	~	17

N. R.-Varm yard in manure was applied before planing while the artificials were top dressed at the time or earthing up the crop.

Both the crops were irrigated. Potato was given well irrigation while sugarcane received canal water. In the case of potatoes the average outturn of tubers is highest on the plot treated with farm-yard manure. The application of nrtugical menures has not resulted in the increase of yield. Besides the cost of these minners is higher than farm yard manure thus making the concern on the whole a losing one.

The top dressing of engarcano with artificials has resulted not only in the increase of gut but also in the increase of nett profit. Safflower cake however seems to he the best manure in this particular case. The results with ammonium sulphate either nione or in conjunction with sufflower cake are encouraging where as ammonium sulphate in addition to potassium sulphate does not seem to have profitted the crop in any way.

It is however too early to conclude anything definite, many of the experiments being still in their infancy. The difference in the previous treatment of the plots which shows itself for many years often spoils the whole thing. The results therefore are not quite reliable nuless they are repeated a number of times. Again when the washing of plust food especially nitrogen, and the rise of alkali, in irrigation, are taken into consideration, form-yard manner seems to retain its present position as it remedies both these evils by being slow in action and diluent in bulk.

# Agricultural Co-operation Abroad.

BY

#### R L. Udyaver,

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Auditor, Co-operative Credit Societies, Bombay Presidency.

JN India, the agricultural conditions are severe; the pressure of 4 population and of foreign competition renders it necessary to cultivate land as thoroughly as science and art can devise, and yet as cheaply as good business arrangements can secure. All sorts of panaceas have been proposed, but the only available one is that which is but partially tried, riz., self-help. The difficulty is as to how this remedy is to be developed and applied; the cultivator is in need of capital, of experience, of initiative, of self-reliance; the more intelligent or richer proprietors stand afar off. It is in co-operative associations of the various classes that the true agricultural remedy is to be found. There will be in my mind, one remedy but diverse applications of it. It will be necessary to assist in the supply of credit, the day elopment of knowledge, the stimulation towards new departures, the re-approachment of classes, education in wider ideas and in business-like habits. So far as India is concerned, it is not unsual to excuse the present condition of things by saying that agricultural co-operation in any approach to a widespread and practical system a absolutely in its infancy; that Indian agriculturists are reporant and indebted, suspecious and conservative and that it is impossible to organise them in any kind of associations on account of their atter individualism. But a glance at the economic history of almost all Enropean countries will show that in every one of them similar, nav even worse, conditions pre ailed only thirty years ago, and that the way in which all these countries overcame the dis advantages of their position, and boldly met and were made only the stronger by adverse circumstances, needs special study on the part of every one interested in the welfare of India.

Since the peasants became the leaders of the associated movement in Demmark, they have imparted a new spirit to its development in the course of a few years; the peasants have established a co-operative organisation which has wen the admiration of the whole world and

raised agriculture to such a bigh technical level that large business concerns are left far behind, or have only recently begun to follow. "Reduced to the proportions of a dwarf," says E. A. Pratts in his book 'Organisation of Agriculture' Denmark fought against adversity with the conrage of a giant; and, crippled though she was, she not only remined her strength, but became a power in the commercial world with which other nations have had senously to reckon. What with her very practical and comprehensive system of agricultural education, her elaborate development of an easy and most effective agricultural credit, and, finally, her great variety of agricultural co-operative associations, Germany may well claim to have reorganised the position of the cultivators of her soil in a way that has brought to them a measure of success, and to herself a degree of economic advantage, that would have been impossible if, when they were threatened with agricultural depression, they had clung tenationally to old ideas and antionated methods. Count de Rocquigny of France writing in 1884 says-" It was necessary to organise for the (economic) struggle, to realiso promptly all the possible opportunities for progress, to decrease the cost of production, and to improve the methods alike of production and of sale. For the attainment of these ends the old agricultural associations were but ill-prepared. It no longer sufficed merely to spread technical knowledge and to give prizes and awards to agriculturists at periodical exhibitions". The co-operative mevement in Belgium has hardly yet developed, and already the agrarian crisis has moderated and in some parts of the country at has already come to an end. There is, in fact a real awakening of agriculture. Experience has already shown the value of such institutions. The peasants found that they could buy, at lower prices, products of a superior quality, guaranteed by trustworthy analyses against frand. The soil began to produce abundant barvests; the cattle, better nonrished, improved in quality and gave a richer milk. Confidence in the future revived many hitherto-disconraged cultivators. The peasants of Italy were, perhaps, even worse fitted than those of most of other countries of Western Enrope to meet the agricultural crisis when hundreds of persants were being sold up for non-payment of debts which often did not even exceed five or six shillings in amount; when more and more land was going out of cultivation; when the ranks of the unemployed in the towns were being swollen by constant accessions from the rural districts; when emigration went on at a greater rate than ever and when Italy seemed to be ill-equipped, indeed to meet the coming economic struggle for the markets of the world. But as to the accomplished results in Italy, though the movement is of comparatively recent growth, and the full development thereof has still

to be attained, the agricultural revival has been spoken of us a resprrection, and there is, indeed abandant evidence that from both a material end a moral standpoint the outcome of the movement bas already had a most powerful influence for good. Materially, the decentralisation of capital which has saved the Italian agriculturist from the money -lender, end placed an easy credit within his reach, have in the first place, led to a greater amount of land being brought under cultivation. Then the increase in the extent in the land cultivated has been followed by un increase per acro in the yield therefrom, owing to the greater use of fertilisers, machinery &c. as encouraged alike by the spread of agricultural instruction and by the facilities offered, in regard to purchase, by the ugricultural societies. The quality of the stock has improved, agricultural industries are affording new openings to energy and enterprise, and the whole agricultural position has nudergone un improvement that is little short of marvellous, considering how recently it was that the Italian peasantry found themselves faced by some of the severest forms of economic depression that any country could be called npon to meet. Morally, too, the effect has been great end none the less striking. The movement has established confidence and kindly feeling between conflicting elements; has made illiterates to learn to write. To be rescued from the grasp of the nanrer was in itself almost a revolution, which was completed by the epirit of independence and of self-reliance and other moral qualities which association fosters. All these and the various other conditions following from fraternal association bave had their reflex action on village life in Italy, investing it with interests and possibilities bitberto undreamed of, and filling the peasants with new bope und trust in the future.

Similar accounts may be given of ulmost every one of the countries of Europe, but it is nunecessary. Jupan, too, following in the footsteps of these countries, and eager to benefit by their experiences, has readily adopted and put into practice the conviction that, if egriculture is to prosper, it must be by means of effective organisation, conducted along lines saticle to local conditions and requirements, and 'founded primarily on a heppy combination of State-air and nextre self-help. In India, itself, the movement has shown a life and vigour which, looking to its young stage, has never before been witnessed in this particular movement within such a short space of eight years of its birth. The progress made is quite phenomenal, such as has nowhere also been previously known. The movement has not, however, yet begun in other and more important spheres of ogricultural co-operation and the

credit movement may be said to have only tonched the hem of economic life of this great and populous Empire.

The report submitted in 1-96 by the Parliamentary Recess Committee for Ireland, of which the Right Hon'ble Sir Horace Plankett. M P., was chairman, positively decland that the investigations of experts into the co-operative movement on the continent of Europe have borne proof to the fact that eight of the countries there have found by practical experience that agriculture cannot be made productive without being wedded to co-operation ". Co-operation has been de-cribed by a great authority as the "German farmers' stronghold and bulwark". "And the more I manired the more I was met by this striking fact" says Mr. Pratt, in his myalicable book the Organisation of Agriculture, "that in every one of the conotries ( of Europe ) there has been an agricultural revival which has led to the spreading throughout each of them of a more or less complete network of agricultural organisation. manifesting itself, in varying degrees, in the spread of agricultural education, and in combination among the agricultural community for an endless variety of purposes, including the virtual transformation of farming methods in accordance with the latest developments of agricultural science; organi-ations to obtaining agricultural necessaries of reliable qualities at lesser cost; the purchase in common of costly machinery which would otherwise be beyond the means of a small cultivator: the formation of co operative societies for purposes both of production and of sale; the setting up of agricultural credit banks as a means of keeping the firmer out of the hands of the usurer, and enabling him to carry on his operations more successfully; and the improvement of the individual lot of the agriculturist in many different wars ".

Nearly all civilized countries of the world have since recognised that only permanent remely for agricultural depression and the only true solution of the industrial problem which is involved in to be found in co-operation. The latest requires instituted by the International Cooperative Alliance into the various methods adopted by the agriculturists to improve the condition of their industry have further elicited the fact that in nearly all countries, including Great Britin, co-operative methods, in some form or other, have here employed to meet the requirements of the agriculturists. It is therefore necessary to examine these co-operative methods and to find out how far their growth has been co-extensive with certain broad changes in the methods and nature of agriculture.

Agricultural organisation resolves itself primarily into four essential factors —I. Co-operative Societies, II. Co-operative Associations, III. Agricultural and Co operative Education, and IV. State-Aid.

It will be subsequently shown that the history of agricultural cooperation in all the countries of Europe shows that, in order to attain success, all these four factors are equally necessary and that where one of them is lacking, there the movement has not made rapid and thorough progress much less attained perfection. Co-operative societies and associations have no doubt extended their away over all classes of people to the unspaikable benefit of their material and moral position Education, however as a means of leading the mass of people to understand and value co-operation us an educating, emancipating, stimulating and moralizing factor, and of bringing up the growing generation with a knowledge of the social and economic significance of the various kinds of associations; and State-aid, us a means of stimulating cooperation, promoting the formation of co-operative societies, furthering their development, and vivifying private enterprise are necessarily wanted. They are not open to any tenable objection as they have been resorted to by all the countries, including Great Britain, irrespective of their relative differences and Stages of civilization.

These Societies can be divided grossly into four main heads .-

- I. The Agricultural Bank, more commonly known as "a rural co-operative credit society," courses to the agriculturist the money which he requires for the purchase and improvement of his land; for the purchase of cattle, seed, or manner; for releeming old debts; for the payment of rent, assessment and legal capases; and for meeting his various knows of bousehold expenses and petty hunges.
- 11. The Supply Society is intimately connected with the credit sourcy being in most cases structurally similar; but with this distinction that while the latter supplies cash, the former supplies agricultural materials.
- III. The Productive Society is composed of agricultural producers combined together for the purpose of point production. But this society may cover not only the supply and the sale society but also the credit society.
- IV. The Sale Society is composed of farmers or federated societies for the common storage and transport of agricultural produce;

for finding the best markets; and for securing the most advantageous terms on Railways or Steamers.

There are also some unscellaneous types such as Cattle Breeding Societies, (rop and Cattle Insurance Societies and anch others. The Society for the improvement of breeds of numble apply the co-operative principle in their own special way in usuing bord-books, selecting sires, paying careful attention to breeding, organising competitive shows, special markets etc. The crop and attle Insurance someties are meant for insuring crops against drought, floods, had, excessive rain, insect pests &c.; and for insuring cattle against diseases and death

The Co-operative Credit Societies -The history of rural economy alike in Europe, America and India has no lesson more distinct than this that agricultural classes are in a state of extreme indebtedness due not so much to usury as to causes outside the demands of agriculture, such as poverty, ignorance, se isonal disisters and emdemic disease, Neither the condition of the country, nor the unture of the land tenures. nor the position of the agriculturists affects the one great fact that they must borrow. Still more then is the small turmer of India under the necessity of borrowing. For centuries harasted by wars, misrule, and holding petty areas of often unimproved land; compelled by his tenure as proprietor to expend his capital in the purchase of hand usually at competition rates (or failing to purchase land, to hide his capital underground); owing to the insecurity of the moverble property menneed by thors and decorts and often by their own plunder-loving predatory chiefs : harassed by seasonal disasters hardly exceeded even in Europe, such as drought, floods and excessive rain, cattle diseases, insect pests and blights, must be borrow and borrow freely and heavily, namually and continuously. This indebteduess is recognised in Europe as a position of danger and every country is seeking its remedy in the direction of organised credit. The credit society is therefore considered to be an indispensable necessity. It is found that in Germany, its birth place, it came first in the movement, and that when the credit organisation was complete the other organisations came in the sequel. Germany is verily the model country for co-operative credit and in Germany the co-operative credit as sociation has been the parent of every other form of co-operation. The study of agricultural credit includes the study of the whole of agricultural organisation. Agricultural credit there means to different things-the credit which is built upon the village bank of individual farmers and the credit which starts from those same men organised into a society for the supply, production, and disposal of agricultural commodities.

Supply Society:—A Credit Society no doubt frees the farmer from usury in money, but it cunnot free him from usury in price. Alike in the supply of seed, manner and cattle, and in the disposal of their crops, the farmers have to safler a loss of from 25 to 50%. No mere change in the michinery of eredit, therefore, can of itself effect a radical cure; it can, per ss. only pulliate the symptoms or retard the catastrophe.

In economic parlance, agriculture obeys the law of diminishing returns, while manufacture the law of increasing returns; farming is a question of labour, manufacture a question of machinery; farming is a non-specialised occupation, manufacture is a combination of rountely divided processes. But co-operation and agricultural science have chauged these couditions. Agricultural geology and chemistry have together proved that the point of duminishing returns can under scientific treatment he postponed, and that the limit of this postponement must be ensured by the application of 'co-operation'. Earlier economists regarded the soil as having a natural fertility the gift of Providence to be taken or left. When Nature stopped Man could not move, save at a quickly increasing disadvantige. But now, a field is no longer the bounty of Nature, but is built up by Man as much as is a will, composed of matternals that are continually being rearranged and reinforced by manures and chemicals brought from foreign places. Not only is land made good, more abundant and more steadily fertile, but fallow lands and soils confined to a low state or cultivation have been made first class by certain products-Lucerne and veretables which contribute Nitrogen. Thus, lands which were formerly a dead loss to the owner have been made rich and profitable. Formerly a farmer trusted to Nature to refresh the tired land by leaving it fallow once in three years. Now, he humselt replenishes it by the application of chemicals and the scientific rotation of crops. Again, the wooden plough has been replaced by the iron plough with triple shares of steel moved by electricity and steam, instead of animal power. Manure distributors and sowers spread manure and seed more regularly and evenly, and theoroughly and quickly, than is possible by hand; hinding and resping machines reap the crop in much less time, speed being invaluable in the ingathering of the harvest. Rain water had been the chief source of water till fifty years ago and it was not surprising that the richest lands on the banks of the higgest rivers were suffering from the effects of drought, when the river water raised with a little effort could have procured a golden harvest. But now, by means of steam pump and

irrigation and canals, fields, not only those bordering the rivers but also those hundreds of miles distant from them, are being watered.

Thus, in the matters of preliminary preparation of the soil, of machinery and of specialisation of work, agriculture within livoits is approximating towards industry. As regards the changes, co-operation is the instrument which has enabled the small farmer to come into line with modern roetheds. It is the supply society which has provided the small farmer with artificial innances, but seeds and cattle; it is the supply society that has equipped him with modern machinery and other improved appliances; it is the supply society aided by the productive and sale societies, in fact the whole network of co-operation which have educated the small farmer up to the use of these new things and helped to make him what he new is no longer a slave but a master of Nature.

The Productive Societies.—Agriculture is the first industry in this country and its prosperity has the greatest direct influence upon conditions affecting the national welfare. Agriculture supports twenty crores of our people and the gross produce from the land is about 450 crores of rupces or 22½ lts per head per annum. Some estimate it at Rs. 40 and some at Rs. 20. Whatever it may be, it is true that the crop yield per acre in ladax is the lowest in the world, which owing to the ignorance and indebtedness of the peasurat is declining still further, and the exhaustion of the soil is fast proceeding. Again 104½ million acres of culturable land are lying wasto for centuries as against 207 millions under cultivation. If nally 50 % of the present proluce were to be increased and only 25% af the present culturable waste land were to be reclaimed, we could get 900 crores of rupes as the gross produce thus obtaining the proverbial two blades I

Accepting the fact that the productive processes concerned must be conducted on modern lines, co-uperation alone enables the small farmer to be at once a small farmer and a partner in a big industrial concern. The scientific system of agriculture is feasible only if undertsken by capitalist farroers who can afford to commence farming on a large scale. For the scientific method of agricultural production at least a bundred acres are necessary to make provision for sufficient water, good manure, selected seed, greater divisions of labour, the opportunity of missing particular crops according to the suitability of land, greater rotation of crops and greater scope for experiments. And co-operation alone can procare a small farmer all these advantages; a small farmer added to another small farmer makes a large farmer. To those may be added

the advantage possessed by the farmer who works on his own account, riz. the intense interest taken by the cultivator in his work, the spirit of independence and of self-reliance and other moral qualities which co-operation fosters, as also the social influence which it confers on the possessor of land.

The productive societies are much more complex in their constitution than these previously considered, and include the credit secrety as well as the supply society and may involve the sale society also. these societies can be worked with ease and simplicity in reclaiming waste lands which in Lombay Presidency amount to about 14 \$ lacs of acres. These societies require a large amount of capital to purchase land, to renair fields, to construct canals, to dam rivers or brooks, to purchase improved implements, to baild houses for farmers, to purchase seed manner and cattle, to build storehouses and cattle sheds, to purchase field machinery for pumping water, ploughing, sowing, bindmg, rearing, threshing and for several other purposes; to purchase farm machiner such as chaff cutting, grinding, cru-hing, winnowing, pounding and so on. Again, the farmers might want losus for marriage expenses; for paying assessment and landlords' rent; for redeeming old debts; and for several other hou-chold purposes, for which capital is also necessary. Thus the society might carry on the functions of a credit society. Further, the society might have kept a stock of ploughs, or maintained a good breed of cattle, or stored seed and mannre, and it might loan cut any or all of these articles to their turmers, the value being extinguishable from their wages or other earning. The society might also instal a pumping engine and might supply water at so much per honr. These operations appertain to the supply society.

Again, a society of engarcane growers might require a singar factory for manufacturing sugar; a cotton gimwers' society might require a gin or a press for gunning their cotton and pressing it into hale for transport; a wheat growers' society might require a grinding mill for manufacturing and exporting floar; or a paddy grower' society might require a rice halling factory, for separating the busk, for cleaning and pounding the rice and so on. And thus export their respective goods at a cheaper cost and obtain better prices for their commodities than they would have otherwise done. Thus, this same society might take up the functions of a sale society in the matter of transformation of the produce of the soil and transmission of the same to distant markets for sale.

For agricultural production India possesses great natural advantages which when fully utilised, will surely add greatly to the wealth of the

country. Agricultural production, on scientific lines, is important not only in itself, but on it are based all possibilities of the development of manufacturing industries.

Sale Societies :- The problems of a sale society vary according to the rature of the commolity to be sold. The articles of immediate consumption such as fruit, eggs, milk, and tiesh require a close knit organisation to arrange for a speeds transport. But the commodities like corn, flix, cotton, or preserves of traits &c., owing to the variations in the harvests and the presence of foreign supplies involve a highly specialised and speculative basiness demanding in a co-operative organisation an expert and locally supported directorate. Again, a farmer may produce his crops primarily for local consumption or primarily for a foreign market. Ruce, pwar, lajer, sugar and gur are examples of the former kind, while cotton, tea coilee, oils, seeds, jute and coit are of the latter. No agriculture can be really productive which is divorced from a neighbouring non-agricultural market, represented by thriving towns and cities. In the absence of such a market near the next available substitute is a large export trade to distant markets or to foreign countries; but the latter cannot fally take the place of the former. Now, internal tride is of two kinds-traffic with the parts, and coromerce with the different parts of the country. For the growth of trade and commerce the development of the means of rapid and cheap transportation is e-sential. Rulways now connect all the principal districts and cities, the great river have been bridged, the country has been covered with reads, and the rivers and causle afford increasing ficilities for transport. Steumship communication has been developed in those parts where the rivers are navigable. The canals also offer some facilities of communication and transport. It is however in meritime transport that the greatest development has taken place.

Now comes the vexed question of Rullway and Steamer rates which is felt by many to underlie all projects for the revival of agriculture, For some years, no doubt, the Rullway rates in Inlia are sterlily on the increase, but the Rullways have special rates for full wagons on train loads which the large compunes the Rulli Brothers are now enjoying and which is possible for the small furmers to obtain by combination; thus saving considerable sums (even 2356) by arranging for the despatch and receipt of larger and more regular consignments. The readers of that invaluable book "The Organisation of Agriculture") by E. A. Pratt need not but toll that the sole elbert and aim of that book is to show how this has been done in all different continents countries.

of Europe. He says "The agriculturist abroad is not a mere unit (as he is in this country) but a momber of a highly and skilfully organised combination which could not only dispose of its production in hig loads but was also able to purchase its necessaries of life in such large amounts as to secure a substantial reduction alike in their cost and in Railway rates for their transportation. The greatest degree of success has been obtained where the associations have been started on a very small scale in rural districts to meet local, or even strictly perochial conditions, and while maintaining their individual entity, have afterwards combined with similar bodies to form district, country or even intoinal federations for the attacament of common advantages. The direct result of these new conditions have been to cheapen and to increase production in the countries concerned; to facilitate and therefore to economise the despatch of the greater quantities of produce available for export".

Miscellaneous—Cattle Breeding Societies.—Animals are greatly used in India for the purposes of cultivation and draught. India's wealth was at one time measured by the number of cows she possessed. She consequently possessed a fairly large empthy of good and serviceable cattle; but of interther has been a great detenoration in the quality, and diminution in the quantity, of live stock all over India; and the want of good cattle has been a great drawback in the improvement of agriculture. The necessity of having cattle breeding societies need not therefore he questioned.

Cattle reving is difficult in those parts of the country in which rainfall is large. Horees are rare at the Karnatic and on the Coronnadel coast; in the dure parts on the other hand such as Kathiawar, Sholapar, Khandesh, very good horses are found. But the most important of the Indian animals are bullocks, which are used everywhere for cultivation and draught as well as load. Buffaloes come next in importance, especially she-huffaloes for milk and give which are the chief articles of consemption. Sheep and goats, donkeys and camels come next: but these are not used largely for agriculture or load and may not come under this head.

Crop and Cattle Insurance Societies .- It has already been shown that the extreme indebtedness of the agricultural classes is due not so much to usury as to sersonal disasters and epidemic cuttle diseases. For, the credit society could supply capital, the supply society could supply seed, manne, cattle and everything ; but what society can make good the wholesale loss caused by drought or excessive rain, or by an insect pest or a crop disease? Aguin, Cattle Breeding societies can supply bullocks, but what society can avert the complete rum from a cattle disease? All a cultivator's capital, labour, and expense go in a dey leaving the hapless farmer a hopeless wreck. Nothing can compare with the ineffable anguish of a totally runed farmer. The nucertainties of trade, war or even gambling cannot be on a par with the uncertainties of agriculture. And Insurance of crops or cattle is the means which can bring a farmer succour in his helpless condition; Insurance can raise him from atter helplessness to power and strength; Insurance is verily the triumph of humanity over nature; and Insurance gives the farmer security for the future. It is by means of Insurance that a farmer is enabled to form a general plan of conduct; it is hy means of this that the successive moments which compose the duration of life are not like isolated and independent points but become parts of a continuous whole. The principle of security comprehends the maintenance of all his hopes. Again, Man is limited to the present time either in enjoyment or snffering but he is susceptible of pleasure and pain by anticipation; it is not therefore enough to grand him against actual loss, by means of a supply society or credit society but it is necessary to guarantee to him, us runch as possible, his possession against future losses. All agricultural countries of Europe. nided by liberal State help have secured the agricultural classes from this wholesale loss by the institution of Crop and Cattle Insurance Societies.

The following statistical table of the agricultural Co-opertive movement in different countries, uptn the year 1911, is drawn up to show how the movement is flourishing at home end abroad.

24") THE	AGRICULTURAL	College	MAGAZINE.
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No	Name: countr			Credit Societies.	Societies.	gale Societies.	Productive Bocietics.	Other	Tota
					1	ļ			
1	Belgium	•••	-	568	1070	73	2133		3844
2	Denmark		•••		15	584	1157	·	1750
3	Germany			15526	2293	444	4334	1889	24486
4	Finland						287	409	69
5	France			3450	5146	800	1812	948	1215
6	Great Britai	n and	}	303	413	43	314	321	139
7	British Inda	a, Coo	rg}	3145					314
8	Italy	•••	•••	1763	1319	45	1395		452
9	Japan			1864	744	187	<b></b>	2354	514
10	Netharlands			582	1166	345	686		277
11	Norway					l	700		70
12	Austro-Hung	ery.		7116		69	651	1887	972
13	Roumania	•					103		10
14	Sweden				500	204	1590	28	262
15	Switzerland			126	150	28	2980	1	328
16	Servis	•		615	1	15	181	42	853
		•		613	1	13	101	**	٠,,
17	United State America	s of	}	20	10350	1800	3000	2554	1772
				35081	23466	4638	21323	10432	9494

# The Industrial Exhibition of the Salvation Army in 1912.

A Plea for Cettage Industries.

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#### Rao Sabeb T. R. Kotwal

or rery interesting exhibition was held in Rombay in October 1913 ander the anspices of the Salvation Army. The results obtained by that organisation as shown in the exhibition were so striking that I venture to lay it before the readers of this Magazine, as being of special importance to all interested in the development of rural life. The principal objects of interest were the exhibits of the silk and wearing industries.

People helonging to criminal tribes could be seen on the two days of the Exhibition, going through all the processes of making silk in all its stages. The first was tending the silk worms fid on mulberry leaves, and tending the worms fed on castor plants. Some of these worms were making cocoons The second stage was the reeling of the mulberry silk on the Zmana Reeling Machine, costing Rs. 30/-or on a frame containing several of these, in a fine, and turned by the hand power of a bor, when several bors sitting in a row could, each one, reel from his basin. The cocoons used were of the Univoltine breed reared from seed from France. The machine can be had from the Manager of the Sir Louis Dane Weaving School The coccous were put in tins of hot water and placed over a stove and left to boil, to remove the gummy substance. The water was thrown away and new boiling water was taken in an enamel pot and in which were placed enough cocoons, scaked in a tin of boiling water. A boy then with a hundle of grass kneaded the cocoons and removed the flors on them with his hand. which is called waste silk, and which is exported to Europe and there spun into thread or mixed with Eri salk and the waste of Tussar Silk. After this each boy caught about 6 thread from 6 cocoons and put them through a needle hole and guided them on so as to be reeled and wounded up by the Zanana Reeling Machine. The cocoons could be seen dancing in the basin. When a cocoon was all nuwound the boy supplied a fresh one. Several other processes of preparing the thread for the warp and the woof were being gune through and lastly one could see a boy weaving a thread into a fabric, on a loom, a patent of a Salvation Army Officer.

For the information of the visitors leastets and primphlets were distributed giving an idea of the exhibits and the industries represented.

- An illustrated paper on the Silk-Worm rearing at the Tata Farm at Bangulure was detributed, reprinted from the Illustrated Times Weekly of 30th August 1911. This shows that the Tata Farm was taken by the Salvation Army in their charge in 1910. The Myenre Government continued their anuall subsidy of Rs. 3,000/-. Any one desiring to read an account of the Tata acriculture Farm at Bangalore and all about sericulture in a nutshell cannot do better than read an arricle in the Agricultural Journal of India Vol. IV. Part I. 1109 by Mr. J. Mollison. He says, "The Farm was started in 1898 to help native rearers to control such diseases as affect calk-Worms in India, and generally to give technical instructions in growing soutable kinds of Mulherries, in rearing eilk-worms, in recling and preparing it for market. The little Farm has answered these purposes admirably." A mouth's course was thought enough.
- (ii) In the jamphlet "What the Salvation Army is doing in India and Ceylon" in the chapter on Cottage Industries the principal exhibits of the Exhibition will be found referred to. About silk it 23/8, "We have concentrated our attention especially on twn varieties of the silk-worm, the ordinary Bulberry-Silk-Worm and the other the Eri variety which feed on the castor plant. While the work is in its initial stages we have already must sufficiently suffer silk-Farms. Great interest has been aroused in the question and it seems only to be a question of time establishing a great movement along the above lines.
- (iii) Another important pumphlet distributed was, "The report on experiments by the Salvatton Army with French, Italian, Mysore and Eri-Silk-Worms 1911-12". Any one interested in the lature of the silk industry cannot neglect arignore this report. It is boyeful in tone, critical of the just work and the methods of the past workers in the field, a faithful record of what is being doos, and full of suggestions for future work.

Acclimatisation of the Polivoltine variety is recommended for the plains and the trapical portions in India, as is being done in Mysore and Burgalore, though the Univoltine variety has been very successfully adopted in Kashmir, at great cost, with seed from France.

(iv) A chart illustrating the life history of the silk-worm with notes of explantion was line, by the sile of the table showing various samples of the silk thread of the Miga, Tassas, En and Mulberry worm receled or span in Indix and in Enrope. Good samples of silk produced and receled at Indere under instructions of the Salvation Army were kept on the table.

Eri-Silk is carded in Europe. It is spin in the Fajalpoore Settlement of the Salvation Army. They do not uso the Pasa Machine but prefer an English Spinning Wheel. Imputations of this made by the Salvation Army can be purchased for Rs. 25/- called "The Sir Lonis Dino Spinning Wheel", from the Manager, " Sir Louis Dine Weiving School, Indhisus, Panjab". A boy can spin three to five tolas on it in n day. Ready thread can be had at its, 4-5-0 to Rs. 6-0-0 per lb. Any one who has seen Makern's Monograph on silk can see a variety of samples of cloth made of Liri and other silks. Mr. Commissioner Booth Tucker can purchase any quantity of any silk-cocoons for English firms at one to two rapees per pound. This rate is much more liberal than the one of As. 8 offered by the Economic Botanist, Ganeshkhind Gardons, Poons. This rate at any event creates some market for the Eri-Silk Cocoons and the Depressed Class Misson can take advantage of it, as also the poor agriculturest who can get easter leaves or Tapioca leaves. Tapioca was tried with success, in Ganesh Khind, after rearing the worms in the first and second moulting on the castor leaves. I have once reared Eri-Silk Worms on Chafa with good results at Talegaon Dhamdhers. I have also reared Dec-Mura in my hall us a recreation on the leaves of the Bunish tree at Sasyal. Lave cocoons or seal for these can be had from the Director of Agriculture, Assam, Shilleng, They are fed on Laurel leaves. Dyed samples of the silk were exhibited. About the Eri-Silk-Worm the pamphlet remarks, "This is no indigenous polyvoltine variety of a bandy character. It is almost entirely immune from disease. The silk lacks brilliance and cannot be recled. Hence it does not equal in value the mulberry-alk but it possesses extranslinary strength and durability and the fact that the worm feeds on the caster plant makes it easy to introduce it rapidly and universally throughout Iudia. This worm eeems certain to take the place of the Tassar."

I quote the following remarks showing the optimistic-view about ailk industry as a Pan-Indian one with great future possibilities. "If success is to be secured in obtaining for India a front runk position among the silk producing countries of the world, a bolder and more generous policy should be putsued instead of leaving to private intivitive, but it is really initial and unremunerative expenditures which are absolutely essential for the ultimate success of the enterprise. It is probable that the Kashaut Government have spent more in one year on their industry than all the other Indian Local and State Governments put together have spent in a decade. Any jet here at India's very gates is an industry which would uncrease her natural wealth and pritect her immense village population from the consequences of drought and famuse perhaps as effectively as her west irregation works and this at an infinitely emaller cost." The opinion of Mr. Commissioner Booth Tacker is entitled to weight as he has taken the advice of Darope's appetra before be formed bis opinion and expressed it in the report.

About Eri-Silk be says, "We were informed by the experts that the would be a limitles demaal for the ecocons at remunerative rates. Unlike the Mulberry ecocons which mat be picked lossly for transportation, the Eri-ecconf can be picked closely like cotton-an important consideration. Being apon and not recled the facilities for spinning it in a marketable form are at present greater in Eriope than in Idia and there seems good reasons for believing that the large export trade may in process of time spring up". As the silk industry occupied a prominent position in the Exhibition, and as my conversation with Mr. Commissioner Tucker Booth and his wife on the subject made a deep impression on me, I cannot hely quoting the recommendations and suggestions he makes in chapter VII of the namphlet. They are:—

- (i) A definite policy should be decided upon and resolutely pursued.
- (ii) In mountain regions where the winters are severe and in districts where only tree-matherry is available, it will be best to concentrate attention for the present on the univoltine French variety of mulberry edk, importing fresh seed from France annually on the system so eucossfully established by Sir Thomas Wardle in Kashmir.

But even here arrangements should be mude for introducing hushmulberry with a view to raising several crops. This can be done in two\_ wars:—

- (a) By keeping a portion of the imported seed in cold storaga till the time comes for its release, as has been successfully done in Japan.
- (b) By introducing healthy, disease-free seed of the Mysore or Bengal polyvoltine variety.
- (iii) In tropical regions the polyvoltine indigenous worms should be given the preference, provided that bush-mulherry is avail able, or that previous arrangements are made for its introduc tion.

Bush-mulberry planted at the Allahabad Exhibition in November was ready for use in January and Rehraury whereas trees are not available for three or four years. In regard to mulberries the introduction of bush-mulberry need not exclude that of trees. The latter need little care, can be grown with or alongside the ordinary crops and require no expense for cultivation, while supplementing the hush-supply, and yielding a crop of leaves at the most important season. The hush-mulberry will need protection from cattle and goats like ordinary field crops.

The training of an adequate and experienced staff of experts is one of the most argent requisites. It is the recognition of this that has led to the establishment of the sulk-farms above referred to and in these and similar institutions it should be possible to quickly give the rough and ready practical training which is required

It is not so much highly trained expects with superior qualification that are required, (though a certain portion of such will be needed as leaders) as the practical training and improvement of the men who are actually engaged in the basiness, and who will look to it for the support of their families. To encourage such, seeing that they are invariably family men it will be necessary to offer scholarships or salaries while they are in training. Each district interested in the husiness should send some men to be thus trained, meeting the necessary expenses.

Where instruction is only desired in silk-worm rearing and in the caltiration of mulberry a brief period of training will suffice. Where reeling is to be included a considerably longer period will be required.

Improvement of seet and protection from disease.—In Bengal seed status have been succee-fully established and micro-copes distributed and this sta vivy small outsy on the part of the Government. Silkworm rearers quickly letter the great advantage of having disease free seed since they are able to rile a much larger percentage of their crop and consequently obtum a much bigher price for it.

Next to Kashmir the Bengal Government is the most advance, and heral in its approve of the salk industry, expending, I believe, Rs. 40,000 annually in doing for the rearers what they are obviously quite mable to do for themselves.

The duty of Government in this matter is clearly recognised in all other countries where-silk worm cultivation is successfully carried on,

It cannot be too clearly insisted upon and recognised that the silkworm industry will never be either self created or self-existant. The laissez faire policy cannot, and never has succeeded in this domain.

Private enterprise should be freely subsidised and encouraged, where it exists, an I where it does not, it will be the obvious duty of the local and supreme Gorenments to mangurate a definite policy and to follow it up with an adequate expenditure of money, which will be abundantly recoursed at no detant date.

In china, which still leads the world, the industry was inaugurated by one of her early empresses, who is to this day venerated as one of the chief henefactresses of her race.

In Japan, which closely follows her lead, no public expenditure is spared which can conduce to the improvement and progress of what has now become one of her leading sources of national wealth and employment. As an illustration the Japanese have just bought a million cocoons from Manchura, and are advertising for 1,500 Chinese experts to start sericulture in Kores.

In Enrope the cult was introduced in spite of climate and other obstacles by Kings and Emperars, with a lavish and yet none too lavish expenditure of money.

If India is to take a leading place, as she easily may, instead of following as at present at the tail end of the procession, a vigorous policy must be intigurised and an alternate expenditure cheerfully male, and private cuterprise duly supported and encouraged.

I saw the Eri-silk thread, span on the Pusa Machine, made into fine socks; neckties, sashes and sandry other articles can, I believe, be made.

The socks were made for me by the ladies of the Seva Sulan, Poons and my thanks are due to Mrs. Rumahu Ramale. The Kuitting machines should be used to utilize the thread.

Fishing thread and thread for leather work can be made with great advantage. I suggest these as large quantities of coccons coords for export canced be collected except one cooperative lines. A visit to the exhibition and conversation with Mr. Commissioner Booth Tincker and the pensal of the literature would make any one hopeful about establishing for sit kin large, as a cottage and stry, saited even for the very poor. I have done it on a small and large scale. The industry may not make one a march sit prove but will add hutter or silt or both to the bread carnel from other sources. The Bombry Agricultum Department has read a Bulletin on the subject. The Pass Imperial Institute has also issued one Nn. 29 of 1012 and Mr. Leftoy's article in the Agricultural Journal of India Vol. IV No. I on the sobject is enough to to such the theory and practice of rearing Eri-silk worms. The review may also refer to Agricultural Ledger No. 10 of 1694, and Notes on Industries of Assum by E. Stack.

I lold Mr. Commissioner Tacker Booth what efforts have been made in the past and were being made in present in the matter of secriculture in the Poona District and the Bombay Presidency and asked him if we in the Poona District could go in for sericulture as a cottage industry and he thought it was likely in be a success. The conditions of success he said were enterprise, proper expert skill and sufficient funds and whole he inted persevering efforts with a smidlently trained class of workers.

Next to the silk industry the weaving industry occupied a large space of the Town Hall. Special weaving looms of the Army's own pattern were kept working. Turkish tuwels were being turned out of the loom. Aboot weaving two booklets were given to a visitor (1) "The Sir Louis Dane Weaving School for the Propab, Ladhiana" and (2) "Hour to start a self-supporting weavery".

These give information as in the work that is being done by the Army among wetvers. Mungers of Institutions, Schools, Hostels and Clubs are requested to help the Army by placing their orders with them. A should remark was beard at the Fancy Buar of the Poona Seva Sadio on behalf of that benevolent institution. I could hear it said that now that students, clerks and gentlemen were necks and stockings.

they can purchase such articles from institution like the Seva Sadau and help the cause of chanty-

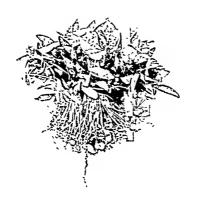
On one table one saw several plants of Eucalyptus and a pot of thornless Cactus. There were exhibits of face drawn thread and needle work. The casava (Tipice) plant or its products were not kept in the Hall ast could not be arranged.

A leaflet on "How to plant Euralypta" was distributed. A Bulletin on the subject is published by the Pusa Institute No. 23 of 1911. Plants cus he had from Saharanpur. Any one desiring to plant these unlarsa fighting trees should state the condition of the climate of his locality and the Superintendent, Government Gridless, Labora can recommend to him the particular kind of tree suitable to the climate and locality There are a large number of Eucalyptus trees in the Ganeshkind Gardens, Poona.

Cuttings of thomless Cactus for planting, which serves as a food for cattle can be had from Salvation Army Danepur Settlement, Jail Road, Lahore. They are sold there. A leadlet as to how to use it, is issued by the Bombay Agricultural Department. On this subject may usefully be read an article in the Indian Trado Johnnal Vol. VIII, Page 21, Cactus as a folder cross.

Cussava (Timore) was not kept in the Exhibition but Mr. Commissioner Booth Tarker asked me to push it on to the notice of the public as a great fighter of famine and a drought resisting plant. I can recommend a perusal of the Government Resolution issued in 1908 by our Government, Agricultural Ledgers Nos. 4, 15 and 10 of 1897, 1900 and 1904 respectively: an article in the Agricultural Journal of India on the subject in 1908 and the American Farmer's Balletin No. 167 of 1903. The Ledger of 1904 gives nearly all the information that one requires. I have planted trees at Dapuri and they have grown well. Cuttings for planting were instanced from the Gaesthehard Gardens. They can also be had from Yi-nli-en Silvation Army, Mavehkaral, North Travancoro. The roots famish u good cheap food.

To the above list of cottage industries may be added the artificial cultivation of Lace on Eabul, Palas, Pimple, Vad, Tar, Bor, Shitaphal and Kasumb trees. Eulletin No. 28 issued in 1912 by the Trus limitate will serve as a gool guile but I may as well tell the redder that the Babul tree can be inocalated with mother-lac from the Bortee. I have done it successfully in the Poons District. My results



Vondzeia Subterranea.
(Mozambique Beans).

have been published. The Bolletin on Page 20 recommends Babul broot-lac for Babul trees. I have dame this also with success. My paper on Loc Caltivation has been published by the Inductival Conference last year. In "the Commercial Guide to the Forest Economic Products of India" Loc is mentioned as an animal product of supprisance and pages 132 and 153 should be read by ever, one interested in the Lac inductry. Very useful information about the Babul tree is given on pages 11, 12 of the above book. It will show what a vast field there is for increasing the lac industry. Mr. Stebling's Monograph on Lac insects, Six George Wate's Lac and Lac industries, Parinnengh's ode on the manufacture of Lic and Chemistry of Lac, as also the several articles in the Indian Truto Journal may usefully be read for an advonced study of the subject.

I would forther add to the list of possible cottage indestries the cultivation of the Stangada aut (Trapa dispinesa) and Annatto. For information on these one may refer to the Agricultural Journal of India Vol. IV.

The purpose of this paper will be served if the description given been of the Fixhibition creates the effect in atmulating the active interest of oil well-wishers of India, in what is being done by the Salvation Army, in discovering channels for reminiently alabour, by way of cottage industries, for the social regoveration of the lower strain of the Society to supplement the efforts of Government in that directly

## Some Promising Leguminous Crops-

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#### H. M. Chibber, M. A.

This well known that legimnions plants of the type to which the pulses and beams belong five the power of utilising nitrogen of the air through the action of the bacteria which form nodales on their roots. Such heing the case the roore we are able to grow legimnious crops the better for our soils so far as nitrogen supply is concerned. Apart from this consideration addition of anything to our existing list of crops adds to the number of rotation alternatives which is an advantage in itself. Of the advantages of rotation the one in the direction of reducing or controlling plant pests and diseases cells for further remarks in connection with one of the plants dealt with in this note. It is no secret that our cruciferous plants, which yield vegetables, are pertucularly liable to aphide-attacks. One of them is Brassica compestie, variety Rapa, (turnip) which produces a solid spherical tuber. Of the plants described below, one produces a taber which might replace the turnip in course of time.

India, as we all know it, exports raw agricultural produce, but India also imports here and there the same class of commodity from other countries. One of them is the subject of this note. It is the sec of a legimmous plant growing in East Africa. The seed is called in Bombay market Mosambi chana. There is no reason why we should not grow it locally in India. So far as I am aware of it this is not done on a commercial cale putil now.

I shall now proceed to deal with the individual plants. For illustrations, see the plates. They represent plants grown on the Poona Agricultural College Farm,

Pachy hizus angulatus.—(Common names Sank-Alu, and Yambean). It is a climbing plant of moderate size. Three leaflets go to form each leaf. The middle or odd leaflet has a markedly toothed margin in the upper half. The flower stalks are long and erect raising the flowers above the general level of the foliage. The flowers are formed in feetooms or in drawa-out-cluster. They are of a beautiful



Pachyrizus Angulatus. (Sunk.llu) Party Stage; Tabber not 3 et Formed

violet-blue colour. The pads that succeed the flowers are six to nine toches long. They are straight and flat, with slight depressions between the seeds. There are to each pot eight to twelve seeds; they are flat, square at the ends, and light brown. The economic or useful part of the plant is the root. This is formed into a fleshy mass of different shapes. The commonest shape is that of a sphere. Other forms assumed are those of a cone and a spin ile. The sphere is usually three to three and a half juches in diameter. The other forms may be six inches or so in length. The tubers are smooth, glos-v, and white on the out side. The skun is fibrons and thin. It is lined within hy a proteid-layer. The fle-h is quite free from woody fibres. It is white and succelent. The chief co tituents of matritive value are sugar and starch. The tubers are eaten either raw or cooked. This plant forms a fixontite grop in parts of India which bowever he out- to the Bombay Presidency. The plant is found to thrave best on a sandy loan. The following account of its cultivation is taken from Agricultural Surveys No. 2 Starting District, published by the Department of Agriculture. Barma.

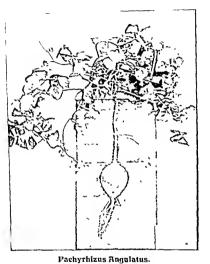
"The ground is carefully harrowed to produce as fine a tilth as possible, and the seel is sown in the months of September—October. Rows are made by the seven toothed harrow nod in these rows seed is sown thickly. The distance between the rows is only about ten inches, so that all the space under the crop is practically occapied by the tubers when they form. Two or three weedings may be given. In February and March the tubers are day up."

Voundzeie subtereum. (Common names Morambique beans, Morambique and the scledific name of this plant implies, its important or neeful part is developed unterground. But this time it is not the root but the fruit or pol that is formed below ground and is collected for human consumption. The pols are rounded and one sceded. Though formed moderground as in the groundant, they lie very superficially. The crop is not a substitute for the groundant, for, oil which is the principal product of the latter is present in only small quantities in the former. It is likely to form a very good supplement to the peas. In Mauritius the leaves are forther unliked to feed stock. The crop is also used in the same island as a green manure. The plants form resettes about six to twelve inches buch.

The following table gives an analysis of the beaus done by Dr. Harold H. Mann, Agricultural Chemist to the Bombay Government, with figures for lentil (masur) reproduced for comparison:—

Constituents of d	ry	Mozambique beau.	Lentil.	
Moisture		2.65	12-95	
Ash		3-65	2 69	
Cellulose		4.25	3-67	
Fats		7.35	0.80	
Sugar and starch		63-15	58.05	
Albummoids		10.03 •	22.03	

<sup>\*</sup> Contains miregen 3 05.



( Sank-Alu )
(Later Stage; tuber fully formed ).

### The Determination of Ripeness in cane.

RY

#### G. R. Mahajan, B. Ag.,

Manjrı Farm.

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NE of the greatest causes of inferiority in the gul or jaggery produced from sngw-caus is the ripenus or over-ripeness of the case. There is a point when caus reaches its meximum percentage of cane sugar. Up to this stage, and after this stage the proportion of non-crystallisable sngars is greater, and lieuce the product made from the juice is not so good as at precisely the right moment. To ascertain when this moment has been reached in a matter, therefore, of great importance,—and though no completely satisfactory method has yet been devised, yet there are certain means which we have employed at the Manjir Farm which give us a better command over the whole operation of cane cutting und gul making than we could have otherwise.

So far as this part of India is concerned, canes can be roughly classified into two groups,—thick and thin. The thick varieties in India anally ripen in eleven to trebve months, while the thin ones take only ten months or even less. In the Decean, the chief variety grown is pundia, and nest comes Labrya (striped cane), while thin varieties, viz. wansia and samnabille are preferred in tracts where less irrigation water is available. The anal time of planting cane in the Decean commences from the end of December and lasts to the middle of April. Cane sown in December is ripe for harvesting in the following November, and so on.

The main point to be considered in sugar-cane is to obtain the maximum percentage of sucrose and less of glucose. The average analysis of pluce in ripe pundea cane such as we grow at Manjii, is as follows:—

 Brix Reading
 ... 20.00%

 Sucrose
 ... 17.50%

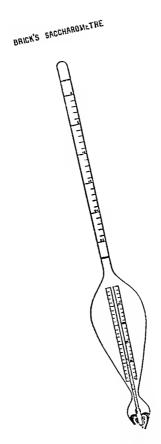
 Glacose
 ... 0.75%

 Other impurities
 ... 1.75%

The total solids in the came increase gradually reaching a maximum of twenty per cent in pushed when about twelve months old. Thereafter it declines. Knowing this we can ascertain with a fair approach to accuracy whether the cane is rips or not, for gul making by a simple determination of total solids. As it has been proved that the ripe stage lasts for only a week or thereahouts after which the gluroso value increases and that of smearce decreases, it is very essential to know the ripe stage in cine, and the chief object of this article is to indicate a cheap and fairly satisfactory method of determining this ringueses.

I will first briefly summarise the methods in vogue among the cultivators -

- Colour of leases: —This becomes yellow and the whole field has a yellow appearance from a distance. This, however, does not always indicate ripeness as, sometimes, in less manured and light soils, the leaves may turn yellow earlier.
- 2. Cessation of growth.—As the came ripeus, the growth is checked and the shoot either does not grow or grows very slowly. The cultivators' term for this cessition is radio pulane ( ৰাই প্ৰত্ন). We cannot definitely tell by this, at what time the came contains the highest percentage of total solids.
- Deepening of colour of the cane skin —In some varieties, the
  ripeness may be judged by this test but it does not hold good in case of
  pundia which is always yellowish green.
- Breaking of the cane at the nodes.—The cane is held at both
  eals and beat. If it snaps suddenly at the nodes when a jerk is given,
  it is taken to be ripe.
- Succenses.—As the case ripeus, the engar percentage increases and it tastes aweeter but no definite stage can thus be ascertained.
- Development of the eye buds.—By the cessation of the growth
  of the leading shoot at the time of ripening the eye hads naturally
  develope. But in some cases as, for example, when the cane is lodged
  we see the development earlier.
- Sound of the cane.—The ripe cure gives a metallic sound when struck but this can be experienced even in raw canes exposed to sunlight.



- Sparkling of sugar crystals.—If ripe cane he cut obliquely and seen against light, crystals of sugar appear to sparkle, but this too is a minor test.
- 9. Obtaining the maximum quantity of "s gut",—or in other worls determining the total -shells in the pince. This is done by a ver wasteful and laborious proces. When the cause are over ten month old, some of them are cru-hell in this they give a certain quantity of gut per unit pan, the cause are pinged to be ripe, if not, the cooles must be dismissed and the work stopped.

The above are tests employed by experience I entirators, and none appear, from their description, satisfactors. The list test is no doubt a sure one but the process is, is I have said, sitsfull. Towards Sholapur, where the gang consists of more than tharty men, the owner saffers heavily if he finds the came marge. A method similar to the last one but infinitely simpler and less costly is to had the amount of total solids in the times.

For this, the western cultivators and the sugar manufacturers use a kind of hydrometer. Of the may varenes of this instrument, Billins or Birt sacchaemeter is the best and no general nee. It tells directly the percentage of sucrose in the pine. The instrument is graduated on a sigar basis, that is, 16 % Birt or Bullins is indicated when the hydrometer is immersed in a 16 % solution of sugar. It is made of gless and has the shape shown in the accompanying figure. When immersed in a liquid, the hydrometer will sink to a certain point depending on the density of the liquid, the pour where the level of the liquid cuts the stem of the instrument gives on the scale the density of the liquid. Owing to capillarity, the liquid rises as much as \( \frac{1}{2} \) inch up the stem. The reading must therefore be taken at the lower level.

The instrument is set at 17.50°C, and hence corrections have to be made for the reding if the temperature of the puice is above or below this standard, according to the tables amplied by the maker of the instrument. Some instruments have the thermometer fixed wi'lm with the figures for correction mentioned. For ordinary purposes, these corrections are negligible.

The method of using this instrument is as follows:—About half a dozen cames are taken from the field and crushed. The pince is filtered through a cloth, poured into a glass acreel,—the hydrometer immersion tube—specially made for the purpose, and allowed to stand for a few

minutes so that all air bubbles may rise to the surface. The tube is filled up to near the brim and when the reading is taken there should be no hubbles adhering to the stem-

The whole apparatus if obtained from any chemist in Bombay would cost not more than ten rapees. The saccharemeter with the thermometer setun, costs Rs. 6f- and the glass tube 12" x1" about Rs. 2/—. Thus s small inital outlay would save the cultivator the immense trouble which his present awkward methods entail and free him also from guessing more or less the rispenses of his canes.

### Notes on the Cottons of Khandesh.

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#### K. D. Kulkarni,

Cotton Supervisor, Northern Division, Bombay.

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(In some former numbers of this magazine the author of the present article supplied some very interesting and valuable notes on the cottons of Guarst. He has now been kind enough to supply similar notes on the cottons of Khandesh, in the form of notes on his own tours in that district.—Ed.)

Pachora Taluha, ... The first village I visited in this part of Khandesh was Pimpalgaon Budruk, a place noted for cotton and considered to have an exceptionally good soil for cotton.

I saw there pure N. R. heing grown in several fields, the parity being as much as 90 % the yellow finwer and N. R. C. type being in very small proportion. The analysis of the plants made on the sport showed:—

N. R. N. R. C. Yellow flower. American.

90 5 5 0

After inquiry I learnt that this purity was negatived by some fifteen cultivators by selecting the bolls which opened first, which naturally were of N. R., that cotton being the earliest one to flower.

This selection has been continued by these people for the last five years and the ginning percentage result is also good, being as much as 57 %. So the purity of N. R. and not the deep black soil is the cause of the better value the people get there for their seed cotton. The yield per acre is 350 lbs.

I next visited Mayaji and Karanji. These two places were known to be famons in the Pachora Market as giving an excellent ginning percentage.

Here it was found that the higher ginning percentage is due to the deep black soil only and no particular type is selected by the people out of the local cotton. The places noted round about Mayaji for cotton are, Kuranji, Varsidi, Dahingaon and Nandra, but all for better ginning due to the deep black soil.

The gunning of these villages is 37 % while the extra price paid to the villagers over Pachora cotton is eight annua per Manual (184 lbs.) more

Recently in these villages some ten persons have been taking special care to pick the early and well opened bolls and their ginning percentage in a good serson is as much as 37.5. As at Pimpalgaon Bodrah the selection will in the end lead to N. R. type almost pure.

Passing on to Nagardevia village I found that the land is red in colour up to Nagardevia from the station a distance of three miles, while further up it improves slightly in colour, becoming a light black soil.

Here the projection of yellow flowers is 30 % in the best samples and the general crop has 40 % of yellow flowers, while the proportion of N R. and N R. C is almost equal and the American plants are rarely visible in the fields. The yield, per acre is 230 lbs. The gunting is as low as 34 % on account of the high mixture of yellow flowers though from the null owners' point of view this cotton will spin "twenties" when the cotton North Khandesh can only spin "twelves" and hence this place is considered by some as a specially good locality for cotton

Here the soil is eighteen inches to three feet deep, below which there is the yellow earth or munum, and at a depth of twenty to twenty five feet there is tran rock and water is usually found.

The rotation here is cotton and Buri bat within the last few years cotton after cotton is being taken on account of the high price of the produce-

From Pachora to Labore the land is light black soil, except in the middle billy portion and near Pachora eastwards, where it is red in colour.

Round about Labore the land is black and the soil four feet deep, below which there is the yellow earth and after twenty feet again there is the trap. The water level here is twenty free feet deep, or more. The proportion of yellow flowers in the general crop is nearly 30 % while the proportion of N. and R. N. R. C. is 55 % and 14 % respectively, the American being only 1 % or lees.

The ginning percentage is 35 % and the yield per acre is 400 lbs.

People here do not select their own seed but the merchants take
out the first picking of some good erop and gin it separately and sell the
seed to the cultivators. The rotation observed here is cotton and journ.

but recently they are taking cotton after cotton for three years by ploughing and minuring the fields, while tower is taken then only once.

Chapita Taluka... The villages noted for good cotton in this Taluka are two in the Chaparda crack and four in the Mangral circle, though the whole Taluka on account of its deep cotton sool and packing of good bolls for seed purposes by each cultivator is considered the best for seed in the whole of Khandesh. But these rillages that are specially noted have got many Goyre cultivators and their method of good cultivation, rotation, thinning and spacing, has caused considerable improvement in the yields and giming precurency of the local cotton which has got 90 %/o white flower the cest being yellow.

Chapards and Akulkheds — Akulkheds has got en 7, of N. R. and 10 % of N. R. C. while the American plant is only stable here and there.

The ginning percentage will be about 36.5 ¶. Chapardi has got 10 %, of N. R. and 20 %, of N. R. C. while the American plants are 1 to 2 % in several fields. The ginning percentage will be about 30. In these two places the yield is 500 lbs. Per acre.

In these two places the lind is about eighteen inches to three feet deep, below which there is relion earth mixed with small pieces of Muram and further down Muram agric.

In the Mangral circle the soil is deeper say three to six feet and ploughing, manuring, rotation and throwing are very carefully observed by the Guar cultivators. These places are also noted for higher ginning and yield, the average yield being 450 lbs. with a ginning of 36 per cent.

Here the mattnee of yellow flower is 10 %, in the whice copy while out of the 90c/o remaining the N. R. type is nearly 80 c/o, N. R. C. So/o and American 27/. The rotation followed is cotton followed by jocus mixed with 10ctd and sometimes wheat or grown or lineed as a Rabi cup. Besides if cotton after cotton to taken sometimes for the higher value of the crop, they put sufficient manner to improve the land.

seed which are mostly of N. R. keep the seed much purer and better in yield and ginning throughout this Tituka than in most other places. In this circle below the deep black soil of three to six feet, there is a mirrum layer of six feet mixed with yellow earth while below that there is only nurrum. The water level is nearly fifty to eithy feet deep.

In this Taluka as we go nearer the Tapti rater, the land improves in blick colour, but the banks of the river, half a talle on each side are formed of allavith and mixed with small pieces of publies and kunkar, and the water level also sinks to screaty-five feet or more. The quality of the fibre of the cotton in this Taluka is in no way superior to ordinary Khandesh cottons of ar as length of stuple and feel is concerned, but the higher rate of seel cotton is due to the higher ginning percentage due to the higher percentage of white flowered plants. The seed merchants generally hay the best lot of high percentage in the market and then sell the seel to the cultivators after ginning the seed cotton separately in the Ghopki gas. Some big cultivators of some villages get their heat lot of the first picking ginnel separately and supply the seel to their own villagers after keeping sufficient for their own risks.

Among the people here it is possible to find men who will grow pure N. R. seed, will gin the seed cotton appearably and will supply a whole village with one variety.

In this Taluka people understand the importance of election while the soil also is of good depth and colour, and the rainfall satisfactory.

Chopda:— Round about Chopla the land is very light in colour for a mile while afterwards it improves mutil there are fields of good deep black soil

The proportion of white flowers is the same here as the Manggu circle while the gaming percentage is nearly 35. 5 and yield 350 lbs. per acre.

The rotation observed here is the same as the blungral circle but wheat and gram are taken rarely here, only when late rains occur, as the soil is lighter than in that circle.

Rater Taluka. In this Taluka the place visited was Sards where the soil is six feet deep, below which there is the yellow earth mixed with pieces of murum.

No kind of selection in cotion is observed by the cultivators here, as among the people of Chopda and thus the proportion of white flowers and the ginning percentage here are less than that of Chopda.

The proportion of N. R. and N. H. C. is equal, about 40 % of each, the proportion of yellow flowers is 18 ole while the American plants are 201c.

On account of the higher proportion of yellow flowered plants the ginning percentage here is low, about 35-6 while the yield, per acre is 500 lbs. or sometimes less in lighter soils.

Here is a great field for introducing pure N. R. and the higher ginning and better yield which it gives will be much appreciated by the cultivators.

The retation is the same as that of Choists, cotton and jowar and is being disregarded similarly.

Bhusaned Toluka - The lant of Bhasawal is deep black six, each or more in depth below which there is eight feet of yellow earth aux, edwith martin and knokar and below it maintain and their thetrap. There are, however, pitches of light yellow soil suitable for zirden cultivation, in which there is no trap below within the reach of ordinary digging.

Here the mixture of yellow this were in the cutton crop is 20 to 25 elo. N. R. nearly 5; olo, N. R. '. 10 oly and American 2 olo.

On account of good soil and the higher percent go of N. R., the ginning of this locality would have been good but the greater proportion of the yellow flowered plants has disminshed the ginning percentage. This only stands about 33% of blut the yield per acro is 100 lbs.

This good yield and tolerably good gunning percentage is better than might be expected though no selection of sect is being observed by the califivators. Still there are some by calibrators who pick their seed cotton for seed purpose but the oalinary people buy their seed from the Markari morehants who do not give special attention to higher ginning or batter yield not offer any better price for seed cotton of better ginning percentage.

Parcal Taluka. -- Much of the land in the Yawal Taluka is of lighter colour, though the castern portion is deep black.

The placevisted was Sakhul, where the upper carth is three feet in depth of light grey colour mostly raived with kunkur and below there is the yellow carth mixed with kunkur and pieces of murum. The water is nearly forty feet below the surface.

Here the proportion of yellow flowers is 2055 while N. R. and N. R. C. are 60 and 2055 respectively. American being less than 155. The ginning percentage is only 35 while the yield also per acre is moderate 200 to 250 Hs. There is no system of selecting well opened bolls here for seed purposes but the seed merchants take the seed of the first picking for sellme to the cultivators.

Here the rotation is the same as Chopda Talaka and is changed similarly according to seasons.

Jalgaon Tatula.—Dhamangaon. The land round about Jalgaon is light and rather salueh but from Acola—two miles from Jalgaoaapto Dhamangaon on the Tapit river at is deep black, varying in depth from three feet upwards, below which there is yellow earth mixed with knukr.

The water level as we go neater to the Lapti river is deeper and deeper and at Dhamaugaon it is nearly one hundred and, twenty feet. The proportion of yellow flowers in cotton in this tract is from 15 to 20% and America 2 % while N. R. C. are 45 and 35 % respectively. The ginning portentings is 35 to 355 while the yield is 400 lbs. per acre.

The selection is done by some people by getting cotton of the first two pickings ginaed separately while the rest buy their seed from the seed merchants without any selection.

The rotation followed here is cotton and joinar like that of Chonda but in deep soils some people are taking two crops in a year when there are Rabi raise as this year. Thus gram and wheat are sown this year after Odda, May and groundout, and even after cotton in some fields.

#### A Cotton and Groundnut Mixture.

[ Translated from the Broach Mitra from the Article by Mr. Chimanial Harderam ].

This ED cropping is not a new practice in the Broach district. It has been carried out for very many years. Cotton is, for example, commonly grown maxed with rice. The object of such a mixture is to provide a future protection to cotton against heavy rains. Rice requires a large amount of water and so takes up all the excess of water and suitable water condutions for both the crops are maintained.

A second maxture of cotton and tur is also common but here both the crops are equally deep rooted and therefore both take nourshmeet from the sub-surface coil. Therefore a second crop of cotton in the succeeding year may not be expected to yield as much as cotton grown after groundant.

Advantages of a cotton and groundaut mixture:-

 Power of groundant to grow on large as well as on small rainfall:



1. = Cotton.

2. = Groundant.

If we grow cetten and groundant us shown in the accompanying drawing groundant takes up the excess of moisture as has been found to be the case during the present year.

In spite of the heavy rainfall of this year (about fifty-two inches) the groundant crop is a very fall one (16 agens) and the cotton is also doing well.

Not only does it sustain the heavy rainfall but also does well in scanty rainfall as that of last year (1911) about fourteen inches as it yielded as a sole crop six hundred and forty pounds per higha (23 pounds' in the Broach district).

- 2 It allows continuous cotton growing:—Generally cotton is followed by journ which feeds on the surface soil. The sub-surface soil on which the cotton has fed the previous year thus gets a rest for a year. But if we grow cotton and groundant as shown above the whole field is divided into 2 parts, one under cotton and the other under groundant every year, cotton following the groundant is alternate years and tree terest. This cotton can be grown every year without any had effect on the fertility of the soil.
- 3. Its power of increasing Nitroges in the soils—The ordinary practice of growing jover in rotation with cotton does not add any manural ingredient in the soil hat only keeps up the fertility by using noun-himent from different parts of the soil in different years. But the crop of groundant affects the soil in quite a different and beneficial way. If we approach young plant of groundant and examine it we find small nothles on roots which harbour betteria which takes up nitrogen from the air and ald to the soil. Thus the soil under groundant is manured naturally and this has a very good effect on cotton in the succeeding year.

Similarly Lang, cal, peas, chola, muy and matati add nitrogen into the soil and cotton after lang always yields better. This fact is well known to the farmers of the Broach district.

Kinds of groundant suitable.—There are many kinds of groundant. Spanish peanut and small Japan grow in the Broach district on mins only without any irrigation, and ripen very early. They give eighty per cent seed in the harrested crop.

Soil.—These kinds can be grown on Goradu Besar and medium black soils mixed with cotton. They grow best on less r land.

Method of sourny.—The land is prepared in summer as usual and soan after the first rain with cotton and groundnut. Take about

O A standard acre is equal to forty gunther.

fifteen pounds of unbasked pols of groundant and saw as such through wider tubes of tin on the drill, to save the cost of basking. Some sow cottons a usual by a two contiered drill and groundant by a three conflered dall in such a way that three rows of groundant should occupy the same space as two rows of cotton leaving between cotton and groundant strips sufficient space to allow the harrow to work.

After germuntion of the groundant it should be through to six inches between the plants in a row. There is no advantage in thinning more as the yield decreases.

Weeding should be done as soon as possible, and then the crop should be intercultured with the "planet panior" hardboe, set with teeth. This hosens the soil and belps root growth of the groundnit. One muse can this interculturate two bights in a day. This interculturate two bights in a day. This interculturate two bights in the safety which no interculture should be done in groundnit, but the lind between the rows of rotton and their safets should be often bood. The loosening of soil on the sufes helps the pol form tion and increases the yield of groundnit.

The groundant sown in Jane (Jyesth) is ready in the middle of Orboter (Ashten). When the plants get rellow one plant should be opposed and seen whether all the reds are full. If so the plants should be uprooted carefully with the roots. Thus all or nearly all the pods will come out. The plants should then be dried in the threebing yard by arranging them in a line with the roots on one side. The pods can be espanted by shaking when well dried.

Yield.—The groundant yields in a mixture about twelve local manufes that is to say 480 lbs. per lights and the hashin weigh about twelve to fifteen local manufes that is to say 480 to 600 lbs. The pools sail at the rate of its. 2-8/- per 40 lbs. and the hashin at the rate of its. 2-8/- per 40 lbs. and the hashin at the same as that obtained for the hashins of Lang, as they are equally nutritides.

The land should be harrowed after the groundant is harvested. Then the cotton gets better wration, light and space and yields about four to five local manned that is to say 160 to 200 lbs. per bigha, and this sells at about Rs. 54-per 40 lbs.

Both the crops bring a return of about Rs. 55 per highs. This cuttum is fairly constant year by year. The introduction of the groundant mixture removes the necessity of frequent fallow, and jowar need to be used as a rotation crops.

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If we manure groundout with sheep manure at the rate of five loads per bigha it yields far better. In gorada land there is danger of white ants attacking the groundant, and so, in the monsoon, the field should be manured with four local manuals that is 160 lbs, of castor cake per bigha when it is raining.

This mixed crop has been sown for trial in Tham, in the Broach District, and has been found fully successful.

Yield of the mixed crop per bigha.

Seed Cotton. 180 lbs. Rs. 20 0 0 Groundaut ... 400 lbs. Rs. 15 0 0 Haulms ... 400 lbs. Rs. 10 0 0

Total Rs. 55 0 0

Last year Patel Nathabbai Bapabbai of Chigaspara in the Broach District sowed groundaut alone which was barvested under the supervision of Mr. Rambhai D. Patel, B. Ag. in the bright half of Ashvin. The yield was twenty-seven local manuds, i. c. 1080 lbs. per bigha.

## Studies in Vegetable Gland Tissues .- t.

BY

#### R. Beale.

#### (1) Introduction :--

Glands of various kinds are found on many plants. Their function may consist of either secretion or exerction. Among plants of the order Enphorbiaceae we find large external glands or unctaries. In this and other orders we find also smaller ones about the real function of which little is known. A study of these latter is to be made in the following articles. Such smaller glands may occur at the base of the petiole and are generally found in pairs. They are also found " replacing stipules and in some cases they surmount them, these stipules being in this case lacinize and fil mentons. In other cases they are found at the base of the lamina, sometimes occurring on a special lobe of the latter. Occasionally they are shifted higher ap on the lamina, two or more of them being present on the lower sale of the lost; they are rarely met with on the upper side, but frequently occur on the leaf teeth. They may be either sessile or stalkel. The secretion of these glands is afton considerable and lasting; in some cases, however, the glands are only functional during the early stage of the organs in which they occur" (Solerator's Systematic Austomy of the Dicotyledous Vol. 11).

The main reason for examining the internal structure of the following glands was to see if it is in any way smilar.

This may show if their functions also are alike.

Among the literature consulted on the subject are Solereder's "Systematic Anatomy of the Dicotylelons" (Boolle and Fitsch) Vol. II and "Plant Anatomy" by Stevens.

The following extract from the former may be quoted :--

"The anatomical structure of these large glands has hitherto been little investigated; the chief work is that of Frombling on the crotanaceae. The anthor classifies the glands as putelliform and morulow. The shape of the patelliform glands recalls that of the poritheciam of the Discomycetes; the glands may be either stalked or sessile. The spidermus of the lower arched portion has sclerenchymatous walls, and the superficial cells of the somewhat raised margin of the upper disc-shaped portion have a similar structure. The discoid depressed surface of the gland is formed by an epidermis differentiated like palisade and having a sub-cutuallar deposit of secretation; beneath this is a second layer of palisade colls with thicker walls, followed by spoogy tissue with cells containing clustered crystals and surrounding the termination of a term. The patelliform glands of the upper side of the leaf of Micranda bracteous Benth, have an analogous structure, but do not proved as lairs.

"Monoi examined the nectaries of Ricinus communis L, Crozophora turctoria, and Homolanthus populifolia. A secretary palisade like endermis is found in this species also".

A passage from Steven's "Plant Anatomy" may also be quoted :"Secretary cells and glands in general."

"These are three kinds of glands in regard to their location and form, namely, the superficial type, which, descended from the productr in borne at the outer surface and may rise above it in the form of hairs or scales; the interior globular type consisting of a more or less globular group of cells; and the interior tubular type in the form of a tube or causl. Glands belonging to the first type commonly known as glandular hrits arise by the tangential division of a protoderm cell producing a multicellular har, the aprical cell of which enlarges and becomes the secreting cell ors group of secreting cells may compose the gland at the apex. Nextaries are usually of protodermal origin and their cells are frequently elongated midically in the form of profilms."

(2) Technique.—The process employed in obtaining sections of these glands for microscopic examination is known as the Partifian method. It is the most important of all histological methods now in use. It consists first of killing and a fixing. Usually the same reagent—in this case, Chromeacetic Acid—is used for both killing and fixing. Life must be brought to a sudden termination and fixing is necessary to so harden the material that the various elements may retain their natural condution during all the processes, which follow. The killing and fixing fluids must be taken into the fields, and specimens should be placed therein immediately after cutting. These should not be cut larger than I inch other. They may be allowed to remain in Chromeacetic Acid for 24 hours.

Washing,—The fixing solution must next be washed out from the material as completely as possible. Washing should be done with running water if possible. This requires from 12 to 24 hours.

Hardening and Delydrating.—It is necessary after washing to these purposes. The presence of mustare interferes with the infilteration of parallal, hence the necessity for dehydrating. The process must be gradual. The specimen should be passed through the series of alcohol in the following order.—

```
35 A Alcohol.

59 A ...

50 A ...

55 ...

55 ...

50 ...

60r 6 to 24 hours each.
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Absolute Alcohol for 24 hours. This should be changed once or twice.

It is next necessary to clear the material. For this xylol is used. The transfer from alcohol to the clearing agent should also be gradual. The following is a good method:

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3 parts also into at cohol and 1 part xylol 2 parts , 2 parts , 3 parts , 3 parts , 3
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The transfer from clearing agent to Parafin should be slow. The convenient method is to place a small block of parafin in the paraclearing agent with the material. The parafin disolves gradually, six to ten hours being usually sufficient for this step. The material must now he transferred to a parafin both for infiferation, which has of course already begun. It is now necessary to get rid of the axiol. This is done by transferring the specimens from the mixture of xylol and parafin to matted parafin. The temperature of the bath should be about 55° C. The time required for infiferation vites with the nature of the trisane and the size of the parce. To the glands under consideration infilteration went on over night, The parafin is poured out into a watch glass, which his percentage here a mereal with glyceme to prevent sticking. The layer of parafin should be just sufficient to cover the object and should be expled as rapidly as possible after the objects have been imbedded.

The paraffic containing the object should be cut into a convenient shapp like a block, the surface to be cut being a perfect rectangle. This may now be fixed on the microtorus and a ribbar of sections made. As soon as a goal ratifit section has been obtained it should be separated.

from the rest of the riblon and florted on a drop of water on a slide smeared very thinky with "gg-albanes, which is applied to make the materal adhere. Gentle herting-not sufficient to melt the paraffin-belpy to lay the section perfectly flat on the slide, which should be left over melts on the top of a heated water bath.

To remove the paraffin the slide should be just into xylol, which should afterwards be rused off with absolute and then 80 % alcohol and finally with water.

For the purposes of this research etaining was done with Delafield's haematorylm for 10 minutes. This coloured the cell walls blue, After stanning, the section is russed in water for 10 minutes, dehydrated in 80 % and ab-oline alcohol and cleared in x10.

A drop or two of Canada balsam is put on the section, which is covered with a cover glass.

A label, telling the number of the slide and that of the block from which the section was cut, as well as the thickness of the section and the staining agent employed is fixed on one end of the slide.

( To be continued. )

#### Agricultural Associations in the Deccan.

PA

#### V K Konchae L Ag.

Organiser, the Decvan Agricultural Association, Poona.

MHI utility of Agricultural Associations if properly worked is no fill longer a subject of depute. It has been over and user admitted on all sides, that there must exist an organisation, a body, which would serve as a link between the Government Agricultural Department, and the cultivating classes. It is not perhaps too much to say that without he aid of associations it is impossible for the work done by the Agricultural Department to have those wide spread and beneficial results which alone can justify its existence. The individual members of these misociations being well-known men an their neighbourhood, men of experience in practical every day cultivation, the ordinary cultivator will listen more readily to these than to any other—expert or official. It is necessary, however, that midradual arenders should work. And where the associations have got these right sort of men, their work has been and is going on well, and is being highly appreciated and followed by the cultivators.

In the Marathi speaking tracts of the Rombay Cresidency there are altered her twenty nine Agricultural Associations. Ont of these, seventeen are in the five districts of the central Division, 112. Poons, Salars, Shelapur, Nasik and Almedonger.

I had this year the opportunity, as organiser of the Decean Agrientiral Association, of visiting these associations situated in these five districts. It will be of interest to know their activities, and the general agricultural improvement these are calculated to effect, and the benefits resulting therefrom to the agricultural public.

In all these fire districts the Ahmednagar District tops the list in point of the number of Taluka Agricultural Associations it has. This is due to the spirit of organisation that existed in some of the gentlemen who were instrumental in starting that phoneer agricultural association in the Daccan, I ment the Sing unner Agricultural Association. This was the first association in the District and the rest followed its example. This is also due to the agricultural shows which used to be both in this

district almost every year, both at Ahmedangar and in the Talakas hy rotation. These shows created a good deal of awakening in agricultural matters, and the people that scame to know the nihity and importance of agrealtural associations. In some of the Talakas Committees of intelligent, and well-to-do cultivators and land-holders were formed to represent their Talaka at the District shows, and to give their own experiences of any new crop tried, the advantages from any field improvements effected, e. g. of Tala part up, the use of the Jumper-bar for deepening wells. These organisations afterwards developed into agricultural associations. In others these were formed through the zeal and interest in agricultural matters on the part of feed men.

At some places these associations were started at the instance of the central association, which created a good deal of interest in agricultural matters by meetuges and other ways among the local men. In certain other places besides the objects of the improvement of agriculture, the ornanisation was formed for the co-operative sale of farm produce.

In the Satara District, in addition to the regularly formed Agricultural Associations, which are in two Talakas only, in rest of them the District Revenue authorities have nominated certain intelligent cultivators from each Talaka and they are often brought together to receive information on agricultural matters, and to this organisation the name "Agricultural Associations" has been given.

From the foregoing it will be seen that under whatever circomstances, these associations might have been started, their main object consists in the improvement of agriculture. The work of these associations until recently was limited to obtaining good seed for divtribution amongst its members from the agricultural Department or through it and organising of agricultural above in the Taluka.

Before dilating upon the practical work these associations are doing it will not be out of place to give a few words about the Decean Agnenitural Association, its relation to these smaller associations, the help it is rendering to these in maintaining their activities and the work it is accomplishing in spreading the knowledge of improved methods to the doors of the cultivators.

This Decean Agricultural Association or the central body at Poona with its representative membership and the strong co-operation of the experts and officials of the Agricultural Department forms a very influential and useful body in the cause of Agricultural improvement. It disseminates agricultural knowledge, through papers read at its quarter-

ly meetings, by means of its rural meetings held at places away from Poona and by its close touch with the local associations. It publishes an illustrated meganne—the Shette and Shetterar, which goes a long way in furnishing a long felt want, of an agricultural publication of its kind in Marathi, quite fitted to be a firend and companing of every cultivator who can read and write. Furnished with such useful material the Deccan Agricultural associations, as a stimulating agency for the smaller associations.

Work done by the smaller essociations :- A number of subjects which have been proved to be useful by the Agricultural Department, and which can be safely recommended to the cultivators, and are anitable to the narticular locality where the Agricultural Association exists are brought before the Agricultural Associations. The utility of these and the benefits that will be derived from them are then discussed in a meeting of the Association, and the cultivators gathered after care. fully considering if these new methods are profitable to them, some of them undertake to carry out these on their own farms. Some of the aphiects suggested are such as can be followed by any ordinary cultivator without any cost to him and which are within his easy reach. Some which require initial expenditure are taken up by him after having been followed by his more well-to-do and substantial neighbour. Thus at each of the Associations one or more of the individual members follow one or the other of the improvements suggested. These serve as demonstrations to these cultivators of his neighbourhoods who are more eceptical to take to these of their own accord, without seeing them actually done or practiced, and proved of decided advantage,

Some of the very useful and simple improvements are. (1) The proper preservation of cattle manners. (2) the selection of seed. (d) The nee of copper sulphate against smut. (4) The cultivation of early maturing and pmfitable foreign varieties of groundants. (5) Caltivation of good yielding varieties of cotton and wheat. (6) Green manuring with Sau (Tag) for paddy.

The proper preservation of cattle manare and especially urine, which though muonially highly useful is entirely lost sight of in some places. It is not uncommon to find cattle dung carelessly hexped on the ground. In this condition the dung gets dried and loses most of its manurial value. In this connection the storing of dung in a pit and frequently keeping it wet by allowing waste water to drain into it, and

the absorption of nrine in dry earth by spreading the same on the byre floor and thus preserving the most valuable manuful ingredient, can be followed without any certra cost. But these are very simple methods and do not require any great outlevin money but what is required is more work on the part of the cultivators.

Another simple thing within the means of every caltivator and to which no proper attention is given in some places is the selection of seed while the crop is studing in the field. The importance of seed-selection cu not be over-rated. There have come out good results from the selected seed as computed with the on-elected seed. There is a possibility of developing particular strains of seed such as early ripening, drought resistant and so on, by following the principle of seed selection every year. In these days of searchity of rainfull we want early metaring and drought resistant varieties. Draing my recent four in the Ahmelhaughr District, the importance of seed selection with those objects in view was demonstrated on the standing Byri crop, and some of seminary in the Singmuner Tildra have promised to follow the same. This thing like the former does not require any cost, but labour and the desire to do things on the part of the caltivator are the only assentials.

The third thing is the use of copper sulphate as a preventive agunst smat (kan or kajata) in power. In some places sund too such an monut of daunge that a culturation bose sometimes one quarter of his crop. Py spending one amay per acre on copper sulphate for seel-steeping the loss resulting from the disease can be totally prevented.

By the caltivation of the early maturing varieties of foreign groundants, and good yielding varieties of cotton and wheat, instead of the usual varieties of these crops which the cultivator grows, his income per acre is materially increased.

Other needl sulpects and improvements, but which require some investment on the part of the entitivator are, (1) the use of the iron plough, (2) the use of iron sugarance crushing mill. (3) the use of Poons furnace for preparing gul, (4) the use of artificial manures as top dressum for sugarance.

The tron plongh coats Hs. 39. The utility of this implement has been now proved beyond doubt. The difficulty of its repairs, and the replacing of purts is no more now a difficult thing. These plonghs are also being manufactured here by Messrs. Kirlo-kar Brothers in their foundry at Knudal Road Station (S. M. Railway). In short all the things mentioned above can be followed by any cultivator and it has

been found that even with the little initial cost, it always pays him in the end to do so.

Besides the knowledge of the improved methods these associations are given information on occoperation in baying and selling, information about the vermicular agricultural schools, where agricultural education is given to the cultivators, some in this way the smaller associations are stimulated to work and some of these are doing very good work. It won't be one of place to give an idea of the chief lines of work undertaken by some of the associations during the last year.

In the Satara District the Islampur Association demonstrated the use of Poona Farmuse for malmagata, which has proved to be more profitable than the local one. It has this very applied Ammonium Saliphate as top dressing in sugarcine in the field of our of the cultivators' to show its effect sate by sale with the ordinary treated plot, for demonstrating the use of top dressing for sugarcine. It has engaged a man who goes round and shows the steeping of Jowar, and the working of the iron plough. Besides this its individual members curry out one or more of the improvements mentioned thore.

The Satara District Agricultural Association is going to start, during the kharif harvest season, two seed states for supplying pure seed of the staple crop to the ultivators, while the individual members are following the improvements another to them.

The Sugarance Association in the Abmedinger District is popularis, ing Iron-mots, iron-ploughs, foreign varieties of groundants. Its ladividual members have taken to the use of top dressing for sugarcane, the cultivation of foreign groundants, selection of seed, the levelling and bundles of fields to present washing and so on.

The Jamkhed Taluka Association has maintained two grain-stores.

'The Baru Agricultural Association in the Sholapur District has maintained a small demonstration plot for demonstrating the methods of dry farming, which latter is the chief kind of furning in the District to which this Taluku reservation belongs.

The Sholapur Agricultural Association has purchased some iron ploughs and is popularising them by their free use to the cultivators.

The growing of profitable new crops, and the use of the irou plough, and its introduction among the cultivators has been undertaken by ulmost all the associations.

A few individual members from each of the associations, have andertaken one or more of the improvements mentioned above, which serve as so many demonstrations of improved methods to the neighbouring cultivators.

Some of the associations are only of very recent growth and consequently have not been able to collect safficient funds, to carry on certain demonstrations independently like the Islampur or Sangamner Associations.

From the above it will be seen that in most caves the efforts of the associations, and their individual members are joined bogether to push on agricultural improvements amongst the cultivating clauses. Where the associations have no sufficient foods, to hold such public demonstrations, the work of the individual members with slight help from the association in obtaining good seel for them is also doing a good deal in introlucing new things.

On the whole it seems that cultivators are much benefited by such local institutious owing to the general awakening of interest in agricultural matters, and the idea so long held by them that nothing new is possible in agriculture is geadaulty passing away from their minds, and their waws are getting more liberal to adopt new things. This has been observed even in small villages. For the proper working of an agricultural association three things are essential (1) right sort of men, (2) finds mit (3) desire to work.

As regards the first point, well-to-do men, who have got lands and who work them themselves are required. Such men can carry on on their own fields the improvements advocated to them. These latter when actually seen by the others are taken up by them.

The secretary of an association should, I think, he a prid man. He may be called assistant secretary and he should work under the elected secretary, who is honorary. It has been observed that the secretaries of associations are some well-to-do gentlemen or professional men like pleaders who have their own things to attend to, and are thus unable to put their whole heart and soul into the work of the association. Under such circumstances the association only remains in name.

Another thing of importance is that, each District Agricultural Association should have the services of an Agricultural

graduate, who should help the Falnka associations in their work. Par of the time of such a graduate will be thus engaged in assisting the Taluka associations, and part can be very well utilized in making an agricultural survey of the Pietriet, which paces of work will be very useful for the Agricultural Department

Secondly, unless the association has some finds its work will not be followed by its members ) is actually demonstrated and its utility explained it will not be taken up even by an average intelligent cultivator. To do this, therefore, as well as to purchase an implement of praved value for its introduction finds are required. Each association should have a set of such implements. The most useful, and of every day no among these are (i) the new plough, (2) chaff-enter, (3) favelier, (1) hand hoo. These in all cost its, 50. If sufficient finds are available, a resper, a winnower, and a thresher will complete the above but.

The funds required for buying these implements cut be raised by morns of duries amongst the members and well-widness of the association on co-operative principles, and the implements let out on lines A beginning on this principle has been made by the Saswad Agrientural Association, (Pound District) and it has purchased two iron-ploughs with the funds thus rused to begin with.

Thirdly, desire on the part of the members to do something individually apart from the demonstrations by the association as a body, is necessary. Unless these three things exist very little progress will be made.

# The Mutha Valley Co-operative Manure Supply Society, Ltd.

MILIS Society has been formed in order that the cultivators of the Milia Valloy, Poona District—ind more especially the cultivators under the Mutha Valley Cual may by working on a co-operative basis, be able to obtain a supply of concentrated matures at a cheeper rite and of better guilty then has been possible in the past. The sides is that the Society is to purchase concentrated manners direct from the manifecturers and from others, in large quantities, at the time of year when castor cake, sufflower, cake, fish and other materials are cheapest, store until required for me with sugar-cane and other crops, and sell to the members at a rate which gives a maintain of profits consistent with a sound business position. The society will also be able to grammate the quality of the materials which it sells, as all materials will be bought on analysis by the Agituiltimal Chemist to the Government of Bombay.

It is anticipated, on the brais of the prices of just years, that at least ten percent of the cost of concentrated manure will be saved to the members of the Society by this means.

The Society his been promoted by the Deccan Agricultural Assaction. It is floated with a capital of Its. 20,000 in four thousand shares of Its. 5/- each. Of the amount of the shares only Ite. 1/- will be issued at once, the remainder forming a reserve liability of the members. Only members of the Society will be able to purchase manure from it, and every shareholder will be entitled to obtain hundred rapees worth of manure for each share he holds.

The constitution and bye-laws of the Society have been approved by the Registrar, Co-opertive Credit Societies Bomlay Presidency, and its accounts will be subject to admit by him. The bye-laws and certificates of registration are on view in the office of the Society, and members will be presumed to have inspected these, and to accept them.

The Society has been fortunate enough to secure as its first directors, men of business experience, who are also greatly interested in the development of agriculture in Mutha Valley. These directors are as follows:— Sirdar Nawron Pudamjee, c 1. r .- Chairman.

Sirdar Rao Rabadar C. V. Madlest.

Hon'ble Rao Bahadar K. R. Godbole B A . M C E.

Hon'ble Mr. B. S Kamat, r A

Dr. Harold H. Mann, D Sc

N. V. Kutane E-q., Mumbbus

P. K. Tamboowalla Cop., Lon Kalbhor

All applications for shares, or for further infurn tion should be addressed to

the Swiretury,

POST LONI KALBHOR, District Posm.

## College News and Notes.

T pune us to send out with this issue-the last for the current year a number of farewells, to many that we have known so well for the past years. And first among them comes our great Patron Lord Sydenh in who is soon to retire and leave India, carrying back with him a title which he has carned mentionously by all the good he has done for the presidency and most of all, we feel assured, by his efforts to advance agreeniture. We, as members of the institution and department which it was flits Excellency's carnest endeavour to improve and augment, feel justify roud of the signal honour conferred on him. We need not cumerate the doings of first Excellency in this connection. Touching us most nearly, is the College which stands as a memorial of the noble intentions of this Excellency and the Decean Agricultural Association of which His Excellency was the President.

We regret that with our sincere greetings of joy we are obliged to comple a farewell to His Excellency, in view of his approaching departure from among us, and while wishing him and also Lady Sydenhum-who his ever been a source of help to him—Godspeed, we pray that they may be spared long to copy at home their well carned rest.

We feel hopeful that His Excellency Lord Willingdon who is to come as our new governor will continue the trock of Lord Syltecham for come as our new governor will continue the trock of Lord Syltecham for already evinced a deep concern in the affairs of the presidency which he is shortly to govern by presiding at the lecture of Mir. Kendinge and Sir Lee Warner before the Arts Society in London, and undendedily a warm velcome awaits him on his setting foot on Indian Shores.

It makes as again feet relactant to express a prospective goodlyse to the many of our sensor students that are about to finish their course at the College, by the end of March No doubt we feel it, as College days and ways have made us to intimate with each other. Still we wish them the test of success in the test before them, from March 10th, and after it we should be even glad to hear they are prospering in the wide world.

To the F. Ag. and S. Ag. students also-both University and special we tooker our wishes for success and hope that in all the three examinations some names at least, if not all, will shine out as heacons in the first class.

The special students are to have their test commencing in the last week of February. There is a larger number of caedidates this year for the three examinations. The short course men are also to solmit themselves for the certificate examination, at the same time. There are four students for the Diploma Examination, two of whom are from Crylen, where on their return we should be glad to see them establishing the fitne of the College where they have speat, we hope, three most useful, instructive and pleasant years.

We learn that Dr. Mann is also shortly to leave India on leave, soon after the University Examinations. We would wish that before he leaves he hears of very good results to the University Examinations and then has a happy folding and one of satisfaction at home.

We have the pherente of announcing the names of the successful andidates for the Ahmel Blane Bledal Competition. The men selected, according to the confittons and rules lait down, were Mesers, Initiality, Maxim and Kurpel for the B. Ag., S. Ag. and F. Ag. classes. They all have our hearty congustrations and wishes to earn more knowns in the future by their public spiritedness.

Mr. Insundst is also further to be congratulated on being swarded the Gulabdas Bhatlas Scholarship for plassing the highest in the S. Ag. examination last year. This is the first year of award of the above scholarship.

We are pleased also to annonace that another prize is to be awarded from this year—called the "Bhatt-memorial prize" for the student that passes the B. A.g. Examination with the highest comber of marks in Agricultoral Chemistry. The prize to be awarded is a meddl and is intended to commemorate the memory of the late Mr. P. J. Bhatt who was a very saccessful student of the College and who died in Europe in 1911. The prize is the result of finds raised by the friends and admirers of the late Mr. Bhatt and caght to be a stimulus to our students of Chemistry to gain distinction by striving hard for it.

The students of the three classes were taken for a demonstration to the Munjri Farm by Prof. Knight, in January, to study the methods of case juice pressing and the manufacture of gul. Prof. Tryan of Queensland who is on a visit to India to make a study of fungus diseases in India was also present and gave several practical lessons in mycology. He also addressed the students and expressed his high

appreciation of the methods of demonstration and study of agriculture that he had seen on the farm and at the college.

The student's quarters are very nearly rendy and in all probability will be occupied by the statents in June. The engerness, with which the completion of the building was being looked for, seems just now to be in a state of suspended animation possibly because it is a problem to many—especially some of our stont gentlemen who are room matter in pairs how to make themselves comfortable and not to encrotch on each other's toes in the apparently small rooms.

The Library is being daily improved in its equipment of books and in consequence is getting a larger number of stalents to it, who like to spend some time occasionally in reading there. It would materially add to the help of the students if a little more of sitting accommolation were provided. Just now, during the examinations, the windows of the library are seen to provide sevis to those that happen to miss the accommolation of the few chairs that are libers. And it makes one's field representation of the few chairs that are libers. And it makes one's field representation of the few chairs that are libers. And it makes one's make the provided of the state of the second of the few chairs that are libers. And it makes one's make the provided of the second of the few chairs that are libers. And it makes one's make the provided of the second of th

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OF THE Poona Agricultural College, ox

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Tobacco and Rice.

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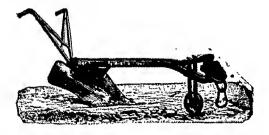
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